International Capital Flows and Financial Market Dynamics: Empirical Evidence from the Indian Stock Market

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International Capital Flows and Financial Market Dynamics: Empirical Evidence from the Indian Stock Market

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by

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under the supervision of

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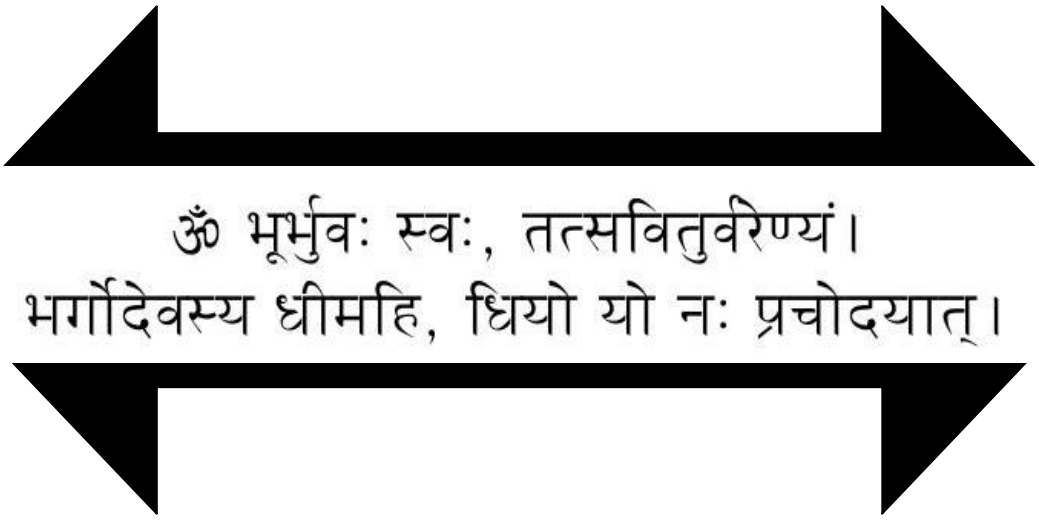
ॐ भूर्भुवः स्वः, तत्सवितुर्वरेण्यं।
भर्गोदेवस्य धीमहि, धियो यो नः प्रचोदयात्।

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This is to certify that the work presented in this dissertation entitled "*International Capital Flows and Financial Market Dynamics: Empirical Evidence from the Indian Stock Market*" by "*Madhusmita Mohanty*", Roll Number 510HS301, is a record of original research carried out by her under my supervision and guidance in partial fulfillment of the requirements of the degree of *Doctor of Philosophy* in *Humanities and Social Sciences*. Neither this dissertation nor any part of it has been submitted for any degree or diploma to any institute or university in India or abroad.

Narayan Sethi

This thesis is dedicated to My Beloved

Brother "Papu", My Beloved Mother

&

Anil

My little Angel "Pihyu"

Declaration of Originality

I, Madhusmita Mohanty, Roll Number 510HS301 hereby declare that this dissertation entitled *"International Capital Flows and Financial Market Dynamics: Empirical Evidence from the Indian Stock Market"* represents my original work carried out as a doctoral student of NIT Rourkela and, to the best of my knowledge, it contains no material previously published or written by another person, nor any material presented for the award of any other degree or diploma of NIT Rourkela or any other institution. Any contribution made to this research by others, with whom I have worked at NIT Rourkela or elsewhere, is explicitly acknowledged in this dissertation. Works of other authors cited in this dissertation have been duly acknowledged under the section "Bibliography". I have also submitted my original research records to the scrutiny committee for evaluation of my dissertation.

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Abstract

During the 1990s, the world economy had witnessed many ups and downs of capital inflows and outflows due to financial crisis and economic turmoil. The rising international capital flows were very attractive from the year 2000, until the global financial crisis 2008. The changing pattern of capital flows does not depend only on external but also internal country characteristics and fundamentals. Since the global financial crisis, wide-ranging cross-border capital flows into G20 nations, including inflows from both G20 countries and non-G20 countries. But they have partly returned to pre-crisis of high tide-lines. They are main below the average level, on a percentage to GDP basis, for the G20, over the past decade. This is nothing but the dilemma of risk. So, the investors' always treat the U.S and some developed market as a safe bucket for investment. Due to lack of understanding regarding emerging markets opportunities or inadequate ability to efficient investment, it is a greater task to quantify the share of both developed and developing countries out of G20 countries.

International capital flows have remained a controversy and puzzle among the existing variety of flows. Both theoretical and the empirical literature on international capital flows have been a topic of argument among the researchers and policy makers. After the liberalization episode, international portfolio capital flows were introduced in the Indian financial market. The existing literature gives a mixed result for international capital flows and its impact on financial market development including macroeconomic situation. In the recent scenario, international capital flows pass through different phases due to financial crisis and many ups and downs in the world economy. It is very important to study the liquidity situation of financial market, international capital flows into G20 countries and its contagious interaction between liquidity, efficiency and returns across the global financial market. Existing literature discusses the total flow from U.S to G20 countries including India, but very few studies focus on gross flows, net flows from U.S to India and its impact on liquidity and returns on Indian stock market. However, U.S is treated as a dominating country due to its monopoly policies and regulation towards the global financial market integration. But the question arises, how far U.S policy affects emerging country's financial markets like India? This gives space for a study. The Impact of U.S policies on global financial market efficiency is also a threat in the present situation. The existing economic theory talks about the Push and Pull theory in an economy. The previous studies specifically emphasize on the impact of different types of flows on financial market efficiency and returns. But the relation between push approach and pull approach and its role in financial market efficiency and returns are missing in prior studies. The assessment of capital flows to exchange rate and current account performance is rarely studied in the context of global monetary policies.

The present study uses variety of econometric tools for the empirical analysis. For the first objective, Pedroni and Kao's cointegration test are used to identify the existing co-integrating vector among variables. Fully Modified Ordinary Least Square Method (FMOLS) and Dynamic Ordinary Least Square (DOLS) were used to find out the elasticity estimation of the variables. To find out the cross-country specification result, ARDL/PMG model is used. For second objective, a Vector Error Correction Model (VECM) has been

chosen for this study as it allows identification of long and short term relationships between variables. In estimating the cointegration, first we have checked whether each of the series is integrated of the same order. Integration of a time series can be confirmed by the standard Augmented Dickey-Fuller test and Phillips-Perrons unit root tests. The number of cointegration ranks 'r' is tested with the maximum eigen value and trace test. The maximum eigen value statistics tests the null hypothesis that there are 'r' co-integrating vectors against the alternative of 'r+1' co-integrating vectors. The trace statistics tests the null hypothesis of no co-integrating vector against the alternative of at least one co-integrating vector. The asymptotic critical values are given in Johansen (1991) and MacKinnon *et al.* (1999). For third objective, Vector Autoregressive (VAR) method, impulse response function and variance decomposition technique are employed to examine the short-term dynamics and casual relationship between variables. Before estimating the VAR model, the unit root test was used to examine the stationary properties of the variables. In this study two unit root tests, viz. Augmented Dickey Fuller (ADF) tests and Phillip Perron's (PP) test have been conducted to examine the stationarity properties of the variables. Finally, for the fourth objective, again VECM framework is used to analyze the relationship between the log of stock prices and the log of output.

From all the above analysis, it is very clear that foreign investors tend to channelize rather than dry-out liquidity from domestic market. Hence, our analysis finds little support from the correlation that, at the time of adverse environment, foreign investors can destabilize the domestic market. As the cross-country specification result indicates, India, one of the emerging countries among the total 18 high market capitalization countries, is having positive causality from flows to both domestic market liquidity and returns with significant coefficient. Also we establish that domestic market efficiency is having long-run association between foreign capital flows from U.S to India. Both the variables, foreign net flows and the "liftoff" episode (quantitative easing episode), have direct influence on Indian domestic financial market. The volatility pattern of U.S Fed rate and foreign capital flows interaction with domestic financial market, presents statistically significant result with net flows but not with Fed rate. Our results significantly reciprocate the present scenario of tremendous increase in capital out flows due to taper talk and QE phase 4. So the empirical result signifies that in Indian capital market both pull factor and push factor works for capital flight. But real financial situation statistically justifies that "push factor approach" (declaration phase of U.S fed rate) has greater impact than "pull factor approach" (REER, Inflation). We can conclude that outflows don't cause depreciation of exchange rate. It implies that capital flows to a country does not enhance the capital account to full extent; rather it helps to maintain the reserve. This study has not found any huge contribution of foreign capital flows to output growth (IIP) but the contribution is positive so far as the fills up of the gap between savings and investment is concerned.

Keywords: *Liquidity, Market efficiency, BSE, VECM, VAR, ARDL/PMG and Economic growth*

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Abbreviation

ADF:	Augmented Dickey Fuller Test
ADRs:	American Depository Receipts
AIC:	Akaike Information Criteria
ARDL:	Autoregressive Distributive Lag
ARIMA:	Auto Regressive Integrated Moving Average
BoP:	Balance of Payments
BSE:	Bombay Stock Exchange
CAC:	Capital Account Convertibility
CAD:	Capital Account Deficit
CRR:	Cash Reserve Ratio
DCF:	Debt Creating Flows
DF:	Dickey Fuller Test
DOLS:	Dynamic Ordinary Least Square
DS:	Difference Stationary
EBA:	Extreme Bound Analysis
ECB:	External Commercial Borrowings
ECM:	Error Correction Mechanism
EECFC:	Exchange Earners Foreign Currency Account
EU:	European Union
FDI:	Foreign Direct Investment
FED:	Federal Fund Rate
FIIs:	Foreign Institutional Investors
FINV:	Private Foreign Capital Inflows
FMOLS:	Fully Modified Ordinary Least Square Method
FOREX:	Foreign Exchange Reserve
FPE:	Final Prediction Error
FPEQI:	Foreign Portfolio Equity investment

FPI:	Foreign Portfolio Investment
FR:	Financial Ratio
GDF:	Global Development Finance
GDP:	Gross Domestic Product
GDRs:	Global Depository Receipts
GDS:	Global Development Finance
GMM:	Generalized Methods of Moments
GNP:	Gross National Product
IFI:	International Foreign Institution
IFS:	International Financial Statistics
IIP:	Index of Industrial Production
IMF:	International Monetary Fund
IPS:	Im, Pesaran and Shin
IRF:	Impulse Response Function
IRF:	Impulse Response Function
LLC:	Levin–Lin–Chu test
LM:	Lagrange Multiplier
MG:	Mean Group
MNC's:	Multinational Companies
MP:	Moon and Perron test
MR:	Monthly return index
MV:	Market capitalization
NCF:	Net Capital Flows
NDCF:	Non-Debt Creating Flows
NRI:	Non- Resident of Indian
NRO:	Non- Resident Ordinary
NSE:	National Stock Exchange
NYSE:	New York Stock Exchange
PCF:	Portfolio Capital Flows

PMG:	Pooled Mean Group
PN:	Participatory Notes
PP:	Phillip Perron's test
PP:	Phillips Perron Test
QEs:	Quantitative Easing
RBI:	Reserve Bank of India
REER:	Real Effective Exchange Rate
RSS:	Residual Sum of Square
SEBI:	Securities Exchange Board of India
SIS:	Schwarz Information Criteria
SLR:	Statutory Liquidity Ratio
SPVs:	Special Purpose Vehicles
TIC:	Treasury International Capital
UTI:	Unit Trust of India
VAR:	Vector Auto-regression
VECM:	Vector Auto Correction Model
VMA:	Vector Moving Average
VO:	Trading volume
WFE:	World Federation of Exchange
WPI:	Wholesale Price Index

We must not let the perfect be the enemy of the good. In a downpour, it is better to have a leaky umbrella than no umbrella at all. There are reforms to the international economic architecture that can bring the advantages of globalization, including global capital markets, while mitigating their risks. We are beginning to see a new consensus forming around ways to restrain the risk of 'hot money' and the goal of developing procedures for orderly work-outs. Hopefully the continuing international dialogue on these and other issues will continue to make progress in these and other areas.

Must financial crises be this frequent and this painful?

Joseph Stiglitz, 2002

Chapter 1

Background, Issues and Objectives of the Study

1.1. Introduction

In the era of globalization, every economy has been touched with international trade and commerce. More access to foreign investment and international capital markets facilitates for the developing countries to overcome their less developed capital markets. The inclinations towards globalization and enhanced economic performance by emerging economies have attracted cross-border capital flows over the past few decades. Foreign portfolio capital flow is one of the major segments of capital flows. From 1942 to 1970, the capital flows were confined to the developed economy and the capital flows towards the emerging economies were very minimal. During oil price shock regime, capital started flowing around US$163 billion per annum (1973-1982) on an average. The net capital flows were at ultimate (US$325 billion) representing 5.5 percent of GDP of developing countries. The post liberalization period witnessed a sharp improvement in private capital inflows by which official development finance lost its pre-dominance. Most of the emerging countries opened their capital markets to foreign investors due to their inner economic vices like, increase in foreign debt, exchange rate depreciation and widening current account deficits and inflationary pressures. For the last three decades, the capital flow around the globe has experienced the cycle of secure development and optimism during the crisis period. From the last three decades stable growth in capital flows concluded with the start of World War I. The capital inflows work like the recovery during the post-war period. Bank lending saw a peak in the 1970s till the Latin American debt crisis of 1982. The 1990s affluent in capital

flows [both foreign direct investment (FDI) and foreign portfolio flows (FPI)] also reached to a sudden expiration.

Again during the 1990s, world has seen ups and downs in terms of capital inflows and out flows due to the financial crisis. The rising international capital flows were very attractive from the period 2000 to the global financial crisis of 2008. James, McLoughlin and Rankin (2014) analyzes, that due to the crisis there is a steep decline in flows from and to advanced economies, with the fall most prominent in terms of cross-border lending by banks and portfolio flows. In contrast, capital inflows to some countries, particularly those to the emerging Asian economies have increased since the crisis. The changing pattern not only depends on external but also internal country characteristics. Since the 2008 global financial crisis, wide-ranging international capital flows into G20 nations, including inflows from both non-G20 countries and other G20 countries have stabilized, but they have only somewhat reverted to pre-crisis high tide-lines. They continue lower than the usual level on a percentage to GDP basis. The total foreign capital flows to G20 countries can be seen from table 1.1.

Table 1.1
Gross Capital Flows to G20 Country, 2005-2015 (US $ Million)

Year	Foreign Direct Investment	Foreign Portfolio Investment	Bank Lending
2005	446	1813	1279
2006	868	2432	1756
2007	1341	2324	2483
2008	940	794	177
2009	811	1194	-1190
2010	1191	1719	937
2011	1502	1139	862
2012	1286	1670	-275
2013	1507	1504	250
2014	1498	1500	255
2015	1503	1508	251

Source: IMF-Balance of Payments and International Investment Position Data

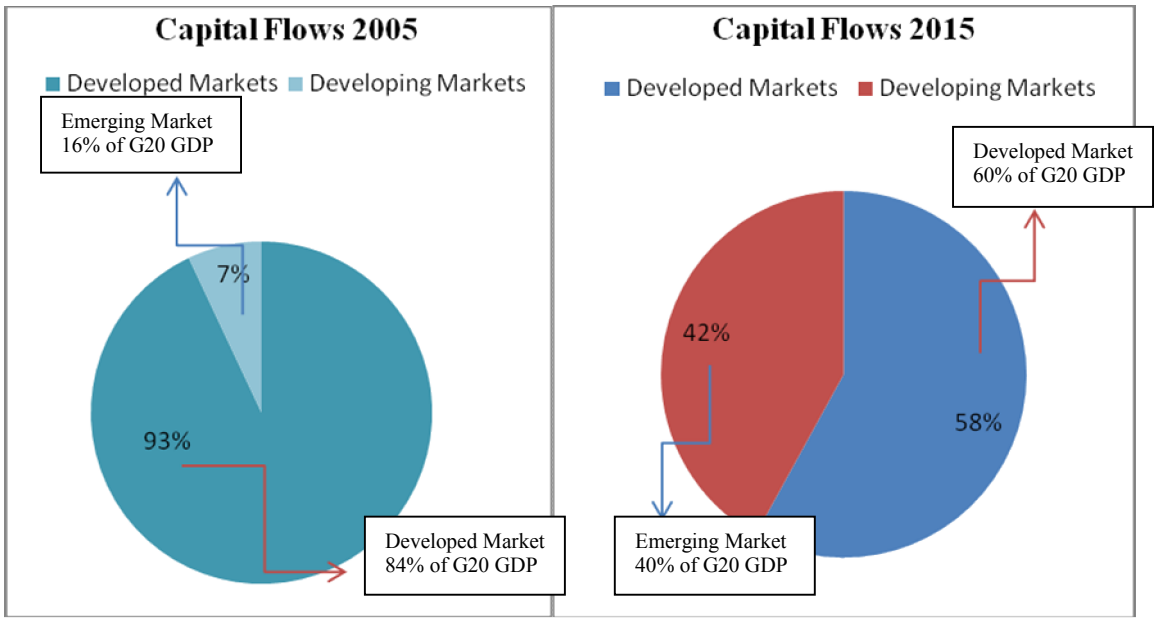

Figure 1.1: Gross Capital Flows into G20 Developed and Developing Countries, 2005-2015
Source: IMF-Balance of Payments and International Investment Position Data

From the above figure 1.1, it is well understood that even though there was a post-crisis strike, international capital flows succeeded in integrating more of the developing market into the interchange of capital due to its multidirectional nature. Indeed, the emerging countries of G20 nations are able to attract reasonably more foreign capital to the percentage of their GDP than G20 advanced countries (figure 1.1). Accordingly, capital flows into G20 developing countries have increased almost five times between 2005 and 2015, while advanced G20 economies have observed more than a one-third weakening in the similar time period. Numerous indicators indicate continuous development in multidirectional capital flows in recent years. As Joseph Stiglitz (2001) quoted, "the problem is a financial system that has failed at its core task: intermediating savings and investment on a global scale". The saving and investment approach works world-wide.

A study [James, McLoughlin and Rankin (2014)] emphasizes that the current accounts of G20 countries prove the perception of reality mismatches. A number of G20 developed-market is having current account deficits and they borrow capital to shield their

expenses, while a number of developing countries run current account surpluses. So the investor always treats the U.S and some developed markets as safe buckets to invest. Due to lack of understanding regarding emerging market opportunities results in inadequate ability to efficient investment. It is important to quantify the investment opportunities of both developed and developing countries out of G20 countries.

1.2. Importance of International Portfolio Flows

Investment strategy basically depends on the perception of the investors. Over time, the portfolio flows are treated as "hot money" in case of emerging market as it is associated with financial risk. The difficult with capital flows interactions implies that, the capital movement creates it informal for investors to pursuit high but in short-term yields countries where appropriating for the short term is shared place. And this tricky of fundamentally untrustworthy "hot money" is not restricted to equity portfolios or bank loans. Even direct investment in elements and filling can be withdrawn, although more deliberately, only if investors are awful of loss. Since the excessive improvement in private investment in developing markets in the 1990s, most of the economies have managed with unexpected overflows and scarcities of capital and their effects. In many cases, the entry (and exit) of foreign capital flows simply worsened the difficulties that were natural to the countries financial structures. "Most crises have resulted from the opening of unsound systems to capital flows," (Obstfeld, 2005) .Thus, there is slight uncertainty that capital flows rendering country to risk in ways that national investment does not. The list of developing countries crises that affected foreign investors over the past 25 years is pretty high in numbers. Evidences from Chile, Argentina, Russia, and Turkey confirm such phenomenon. Besides this, Thailand elicited a swing of currency crises throughout Asia in 1997-1998 following substantial borrowing in foreign currencies and the succeeding profound depreciation of the Baht. In addition to Thailand, Indonesia and South Korea were deeply exaggerated; with others pain substantial economic impediments. At the same time, developing countries found themselves whipsawed by altering the goals and assessments of developed-market

investors, who can overflow a country with investment of one year and wiped out fast in the next. Many of the 1990s crises in developing countries capital market, for example, were generated or worsened by foreign investors rudely taking their money out.

1.3. International Portfolio Flows and Indian Experience

During 1980s, India hurt a serious financial crux. At that time, Indian foreign exchange raised at mere US $1.2 billion which could barely finance 3 weeks' worth of imports. And India had to pledge its gold reserve with IMF to secure a loan of just US $457 million. The gross fiscal deficit of the government rose from 9.0% of GDP in 1980-81 to 10.4 percent in 1985-86 and to 12.7% in 1990-91. The central debt of the government gathered rapidly, growing from 35% of GDP at the end of 1980-81 to 53% of GDP at the end of1990-91, since these deficits had to be met by International borrowings. The instantaneous impression of market opening to foreign portfolio investments (FPIs) is the upwelling in the transaction volume and capital inflows to domestic capital markets, result of which there is prosperous in stock prices. The stock market prosperous, normally, does not last for the entire period. FPIs are the key drivers of the Indian equity market for the past several years. In 1997, the world economy has experienced a sharp decline in capital flows due to various reasons like South-East Asian financial crisis, turmoil in the global markets, failures in corporate sector and accounting irregularities in US in 2002. FPI decreases the vulnerability of financial crisis in developing countries by reducing their external debt weight from 39% of gross national income in 1995 to 26% in 2006 and increase in foreign exchange capitals to 92% of long term debt and 42% of more unstable short term debt in 2006. Global economic development, however, remained robust with the help of current trade and business cycle during 2004-2007. The economic growth in developing countries, particularly in India and China, remains rapid in last few years. Now-a-days, most of the countries are interested in fascinating foreign capital, as it not only helps in generating liquidity for the firms and the stock market but also leads to the

dropping of the cost of the capital for the firms. It further permits them to strive more effectively in the global market. It remains unanswered as to what extent these capital flows are the influential factor for the economic development of developing economies.

A comparable instance cannot be lined out entirely if the shocks in the euro zone mature into a full blown crisis. Foreign portfolio investments (FPIs) owes majority of the risks in more than two-thirds of companies listed in the Nifty, while domestic financial institutions endure to scuffle when it comes to the rising of funds from investors. Foreign investors have been verdict it threatening to keep going this year due to improvement pressures back home and a miserable global economic outlook. But they sustained to rule the perch as they apprehended higher stakes than domestic financial institutions in more than 35 companies in the Nifty as of June 30, 2011. Now it was uncertain whether FPIs can continue their leading situation in the domestic market or flop under pressure amid the global confusion as it may lead to further unwinding of positions. India is treated as the Asia's fourth-biggest capital market; in which foreign fund flows influence the economy to a greater extent. Inflows from abroad surged to a record $29.4 billion in 2010, making the Sensex the best performer among the world's top 10 markets. Rakshit (2006) has interrogated the basic evidence of useful effects of FII flows to India. Separately from the threats of financial unpredictability, he found during the 1992-2002 phases there has been little association between the capital account balance and cumulative investment in India. Except for a couple of years the latter has surpassed the current account balance in all the years since liberalization began. This indicates that FII flows are subsidizing primarily to the accretion of enormous foreign exchange reserves at the RBI rather than to real investment in the economy. Further, this accumulation of reserves implies significant costs for the economy in terms of a fall in government profits through holding of lower yielding reserves, loss of revenue and the costs of sterilizing the inflows. In the presence of lack of demand in the economy, the real effects of improved FII flows are likely to be far from positive. Thus, FII flows should be viewed as portion of a combined policy platform for all

capital earnings. Therefore, the present study tries to examine whether the portfolio capital flows has any impact on the financial market growth and development of Indian economy or not.

1.3.1. Effects of FPIs in Indian Stock Market

Several reforms announced by Indian government to inspire FPIs to capitalize in Indian market have been effective to such an extent that in November 2010 FPIs stood at 5426 whereas it stood at 1713 in early 1990s. The variations have directed to upsurge in liquidity, decrease threat, increase disclosure FPIs have convert the corner stone in the remarkable rise of the Indian stock market. It has controlled to shift of emphasis of foreign investors away from Indian securities traded at London or New York, and the primary markets for India- related equities trading has become the NSE and BSE.

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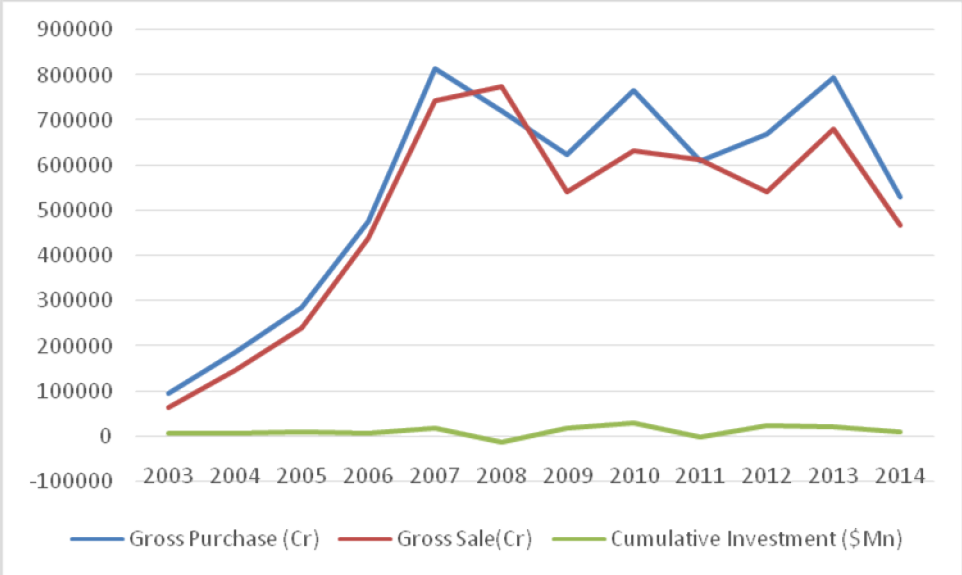

Figure 1.2: Net Investment by Foreign Institutional Investors on Indian stock market 2003 to 2015

Source: Handbook of Statistics on Indian Economy, RBI

The FII flows started to Indian market in September, 1992 which amounted to Rs. 13 crore during 1992-93. Though, in a year, the FPIs rose 39338.46% of 1992-93 during 1993-94 because government had released open regulation for investment in India. Thereafter, the FII inflows witnessed a incline of 6.45%. The year 1995-1996 witnessed a U-turn, slipping up the influence of FPI to a massive of Rs. 6942 crore. Investment by FPIs during 1996-1997 rose to a lesser extent i.e. 23.52% of the preceding year. This age was enough appropriate for FII investments because of international capital markets were in the stage of over-heating. The Indian economy declared strong fundamentals, stable exchange rate opportunities and offered investment motivations and congenial climate for investment of these funds in India. During 1997-98, FII inflows posted a fall of 30.51%. This slack in investments by FPIs was primarily due to the South-East Asian Crisis and the period of volatility experienced between November 1997 and February 1998. The net investment flows by FPIs have always been positive from reform years onward. An outflow to the tune of Rs. 17699 crore was witnessed for the first time in the year 1998-99. This for the economic sanctions executed on India by the US, Japan do the developed economy economies. These sanctions were the outcome of the testing of series of nuclear bombs by India in May 1998. Afterward, the portfolios investments quickly improved and exhibited encouraging net investments for all the following years.

FPIs investments deteriorated from Rs. 10122 crore during 1999-2000 to Rs. 9935 crore in 2000-01. FPI posted a year-on-year weakening of 1.8 % in 2000-01, 11.87 % in 2001- 02 and 69.29 % in 2002-03. Investments by FPI announced a fall of 80 % in 2002-03 as compared with investments in the period of 1999-00. Investments by FPIs recovered from miserable levels from the year 2003-04 and witnessed an extraordinary surge. FPIs flows were recovered to India following rearrangement of global portfolios of institutional investors, triggered by vigorous growth in Indian economy and striking assessments in the Indian equity market as compared with other emerging market economies in Asia. The

slowdown in 2004-05 was on account of global uncertainties caused by acclimatization of crude oil prices and the upturn in the interest rate cycle. The resumption in the net FII inflows to India from August 2004 continued till end 2004-05. The inflows of FPIs during the year 2004-05 was Rs. 45881 crore. During 2006-07 the foreign institutional investors continued to invest large funds in the Indian securities market. However, due to meltdown in global commodities markets and equity market during the three month period between May 2006 to July 2006, fall in Asian Equity markets, tightening of capital controls in Thailand and its spill-over effects, there was a slack in FII investments. Again in the year 2007-08, the FPIs started investing in Indian market with a great believes of Rs. 66,179 crore. On the other hand the collapse in Lehman Brother & Co. drags down the FII investment to Rs. -45,811 in 2008-09. Due to US market crash FII chose India as the best destination for investment and in result they increase their investment near about 58% more than previous 4 decades in 2010-11. From 2013 onwards, the investment by FPIs decreased till the last quarter of 2014 due to global slowdown.

1.4. Importance of Foreign Institutional Investors in Indian Context

Foreign institutional Investments (FII's) are repeatedly observed as the sophisticated investors. As the segment of FPIs in developing markets is in extraordinary trajectory, they have partial over the assets prices significantly. Therefore, policymakers have become gradually anxious about the factors determining international investment. Does the opening up of the market for FII increase speculation in the market and thus make the market more volatile and more vulnerable to foreign shocks? Therefore the present study tries to examine whether foreign institutional investors has any impact on the economic growth and development of Indian economy or not.

One of the key explanations for the FII flows has been the improved appreciation of the long-term development impending of Indian economy. India offers encouraging demographic domain and has rapidly recognized its economic improvement in many ranges. Indian magnates have been quite effective in introduction of dealings in India. FPIs have predictable the detail and unlike other countries where FDI has gained predominance. India has seen momentous growth in foreign institutional investment. Though there could be temporary slowdown or reversals based on interest rate cycles, flow of funds, global contagion etc. over the long term, given the nascence of many Indian businesses and the growth potential, one would see continued inflows. Economy has the ability to produce goods and services at a lower cost can be other reason. The shortage of employment opportunities brings good competition in the labor force and automatically improves the quality and productivity which is highly advantageous for foreign concerns. Therefore, FII flow appears to influence and be influenced by the economic growth of India. FII inflows help supplement domestic savings and smoothen inter-temporal consumption. Studies indicate a positive relationship between portfolio flows and the growth performance of an economy, though such specific studies for India were not found elsewhere. India received a disproportionately large part of its foreign investment flows via the FII investments in the equity markets in the recent few years.

1.5. Research Gap of the Study

There are very few studies existing in relation to international capital flows, economic growth and development. From the existing literature, we derived mainly the flows coming from developed market. The global situation has a superior importance in case of such capital flows such as the macroeconomic condition, the country characteristics and fundamentals. In the Indian context, some studies show that FPIs has positive impact on Indian economic growth and development where as some researchers find negative and mixed result. The variation in these results is found due to the short period of the study, the appropriate macroeconomic variables which are main determinant for the behavior of such

flows. Most of the studies including theory and empirical works show the economic growth and development with respect to foreign flows without concentrating on the country specific characteristics. So the present study aims to incorporate reasonable explanation relating to foreign capital flows from U.S. to India and vice versa. Simultaneously, it will address the impact of capital flows to liquidity and market return among major G20 financial markets. On the basis of the result, the study will focus on the market efficiency, contagion effect and the macroeconomic impact.

1.6. Significance of the Study

The Indian economy is leading to a build-up of observed experience with financial globalization. After the Balance of Payment (BoP) crisis, FPIs act as an imperative source of private capital flows for the developing countries capital markets. As FPIs are profit oriented, they have been marching on the track of enhancing almost all the sectors to the permissible extent. And it has achieved a tremendous milestone in the nations GDP growth, employment generation and improving standard of living in-spite of certain short-comings. The present study aims to establish the certainty of FII not only by justifying the above said points but also by narrowing the gap between Global capital markets, which facilitate a country to compete.

To fasten the economic performance foreign portfolio capital flows role is inherent one for developing countries. An assessment of data about FII inflows into India yields stimulating explanations at the level of both macroeconomics and Industry uniqueness. Therefore the present study tries to makes a preliminary attempt to test the FPIs and Indian economic growth with the help of some major macroeconomic variables. The volatility nature of FPIs makes it as a debatable issue. There is the need to find out the factors responsible for the volatility nature of the FPIs, as in various study it shows negatively related to economic growth. FPIs have convertibility on the equity market, which is the

most important single element of India's openness. The micro analysis of the stock markets also fails to provide any evidence that the entry of foreign institutional investors has reduced the cost of capital to the Indian corporate sector. Nor has it helped the corporate sector to shift from their dependence on internal resources and funds from public sector development banks to the capital market. On the contrary, the evidence shows that their dependents on external sources have declined in general and more specifically on the capital markets. The overall cost to the economy of increased short-term capital flows has been substantially higher than any current or potential benefits. As, FPIs have their preference in almost all sectors of the capital market, it is indeed to inspect the various motives behind diversification by taking the FPIs preference sectors. Due to the sensitivity issue, the impacts of FPIs have been the subject of broad analysis.

There is greater relevance of the present study, portfolio flows to India previously was volatile in nature. Due to strong fundamental and market condition among the G20 emerging nation it is counted as a favorable destination of investment. Taking the world capital flows into consideration will be overfilled to find out actual scenario of India. So in this study we are only focusing the only the cross-border capital flows among U.S and India. It will give a clear picture regarding the present scenario. Here, the question pertains to the issue - Does portfolio capital flows have any significant impact or effect on economic growth in India? After the liberalization period, the global capital market start integrating to each other, this helps investor to minimize their market risk, diversification of portfolio management and minimizing the cost of capital. Thereby, the capital inflow to the equity market increases stock price lower the cost of equity capital and encourages the investment by Indian firms. The study tries to address the following research questions:

(1) Whether foreign capital flows channelize or dry-out domestic financial market?
(2) Do foreign capital flows react during the time of financial crises?
(3) Is there any contagious interaction existing between liquidity and foreign capital flows across market?

(4) Whether the "liftoff" rate of U.S has any spillover effect on Indian financial market efficiency?

(5) Which approach works in case of Indian capital flight; "Push Factor approach" or "Pull Factor Approach"?

(6) Does the capital flow associated with sizable appreciation of the real exchange rate?

(7) Do the capital flows enhance the current account position with macro-economic effect?

1.7. Objectives of the Study

The study broadly examines the effect of international capital flows on financial market efficiency, liquidity and returns in Indian stock market, specifically the objectives are:

1. To examine effect of foreign capital flows on financial market liquidity and returns in selected G20 countries.
2. To examine spillover effect of fed policy on Indian financial market efficiency.
3. To identify the puzzles of the Indian financial market through pull or push approach.
4. To examine the effect of international capital flows on the Indian financial market and economic growth.
5. To suggest policy implication thereof.

1.8. Nature and Sources of Data

This study examines the effect of international capital flows on Indian financial market efficiency, liquidity and returns. The study uses the monthly time series data for different variables from the period of January 2003 to July 2015. For the first objective of the study, we use the major stock exchanges (top 20 by Market Capitalization) of issued share of

domestic companies and categorize the 20 countries in our sample[1]. Our final sample includes 2718 total observations from all 18 stock exchanges, such as, U.S. China, Japan, Germany, France, Brazil, U.K., Italy, Russia, India, Canada, Australia, Spain, Mexico, South Korea, Indonesia, Turkey, Saudi Arabia, Argentina, and South-Africa. We have divided our data into two sets, the first one is 'developed market' and other is 'developing market and emerging market[2]'. Our final sample includes developed markets such as U.S., U.K., Australia, Canada, France, Germany, Japan, South-Korea, and Spain and developing markets such as Argentina, Brazil, China, Indonesia, India, Mexico, Russia, Turkey and South-Africa. We used various sources such as World Federation of Exchanges (WFE), yahoo finance, Money control and Quandl to collect the monthly adjusted price (P; closing price in US$ currency, which is adjusted for spilt and dividends), the monthly return index (MR), Trading volume at a monthly frequency (VO; expressed in 1000 shares) and the monthly market capitalization (MV; expressed in millions of US$). We have restricted our dataset to major stock exchanges of G20 countries[3]. In case of U.S., we use only NYSE stock market data. For some countries like Japan (Osaka and Tokyo) and China (Shenzen and Shanghai), we have collected data from more than one stock exchange. We have taken 18 countries data out of G20 countries for our analysis. We have considered 18 countries out of 20 countries in G20 because of unavailability of data in our study. We have excluded Russia and Saudi Arabia from our analysis.

For second objective, as high frequency information on bilateral portfolio flows amongst countries is not openly available at, we limit our analysis to U.S. transactions in foreign stocks. We obtain monthly data on cross-border equity portfolio flows to India from U.S (expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. The study period includes monthly data from January 2003 until July 2015 has been

[1]As of 31st January 2015 monthly report of World Federation of Exchanges (WFE).
[2] As per the Dowjones, MSCI, FTSE, Russell and S&P report 2013 country classification.
[3]We refer to the exchanges on which majority of each country's stocks are listed in line with Karolyi, Lee, and Van Dijk (2009).

used for the study. Variables are Cross border capital flows, U.S. Fed Rate, Market Efficiency, Market Index Return and Macro-economic variables (Interest rate, Exchange rate and Inflation). We obtain monthly data from Reserve Bank of India (RBI), World Federation of Exchange (WFE) and Federal Reserve Bank of St. Louis.

For third objective, we have collected the monthly data on cross-border equity portfolio flows to India from U.S (expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. This study covers the monthly data from January 2003 until July 2015. Variables are Cross border capital flows, U.S. Fed rate, market index return and macroeconomic variables such as interest rate, exchange rate and inflation. We have also collected the monthly data from Reserve Bank of India (RBI), World Federation of Exchange (WFE) and Federal Reserve Bank of St. Louis.

Finally for fourth objective, the focus is on the interrelationships between foreign institutional investment, output and stock prices; we employed three series – one for stock prices, one for FPIs activities and one for output. For stock prices, we used the CNX Nifty Index for the National stock exchange, BSE Sensex Index for Bombay stock exchange and for output (growth rate) we used IIP. Given that IIP is available only at a monthly frequency, we restricted our analysis to monthly data. The sample period used is 2003(1) to 2015(7), the start of the sample being dictated by the availability of FPIs data. The stock price data were obtained from the Reserve Bank of India data base. Data in this data base are reported on a Monthly basis. As the monthly data for GDP is not available, in this paper we have taken IIP as proxy. To match the stock return and FPIs data with IIP, we use monthly data for all the variables. Neither of the series was seasonally adjusted. This is particularly obvious for the IIP data which has strong seasonal fluctuations.

1.9. Methodology of the Study

The present study uses the variety of econometric tools for the analysis. For the first objective, we have tested panel unit root test followed by Pedroni and Kao's cointegration test to identify the existing cointegrating vector among variables. We have also used Fully Modified Ordinary Least Square Method (FMOLS) and Dynamic Ordinary Least Square (DOLS) to find out the elasticity estimation of the variables. For second objective a Vector Error Correction Model (VECM) has been chosen for this study as it allows identification of long and short term relationships between variables. In estimating the cointegration, first we have checked whether each of the series is integrated of the same order. Integration of a time series can be confirmed by the standard Augmented Dickey-Fuller test and Phillips-Perrons unit root tests. The number of cointegration ranks 'r' is tested with the maximum eigenvalue and trace test. The maximum eigenvalue statistics test the null hypothesis that there are 'r' cointegrating vectors against the alternative of 'r+1' cointegrating vectors. The trace statistics test the null hypothesis of no cointegrating vector against the alternative of at least one cointegrating vector. The asymptotic critical values are given in Johansen (1991) and MacKinnon *et al.* (1999). For third objective, Vector Autoregressive (VAR) method, impulse response function and variance decomposition technique are employed to examine the short-term dynamics and casual relationship between variables. Before estimating the VAR model, the unit root tests examine the stationary properties of the variables. In this study two unit root tests, viz. Augmented Dickey Fuller (ADF) tests and Phillip Perron's (PP) test have been conducted to examine the stationarity properties of the variables. And finally for fourth objective, again VECM framework is use to analyze the relationship between the log of stock prices and the log of output. The study finds short-run causality running from stock prices to output but not *vice versa* but claim that output affects stock prices in the long run, although they do not present test results for this hypothesis. The existing literature on the relationship between the FPIs, stock market and the economy as a whole in India is thus very limited.

1.10. Organisation of the Thesis

The present study is organized into six chapters. First chapter introduces the study, gives an overview idea about the importance of international capital flows. The study subsequently addresses significance, research questions, and objectives, justification of the study area, methodology, data sources, time period and econometric tools of the study. The second chapter reviews some of the existing theoretical and empirical studies made on the impact and effects of international capital flows on macroeconomic variables including economic growth. The third chapter brings out a detailed discussion about the tools of time series and methodology used for study.

The fourth chapter describes the different type of model used for the study and brings the empirical results. It also discusses detailed in section wise, first section explains the effect of foreign capital flows on financial market liquidity and returns in selected G20 countries. Further, this chapter discusses economic significance of the study, empirical motivation, data and estimation approach, methodology and finally the results and discussion. Section II, discusses the spillover effect of Fed policy on Indian financial market efficiency and international capital flows. Subsequently, this chapter presents the few review of literature relating to spillover effect of Fed policy on Indian financial market efficiency, methodology and empirical finding.

Section III, presents to identify the puzzles of the Indian financial market through pull or push approach. This follows sections such as review of literature, puzzles among the wave of international capital flows in Indian experience, data sources and methodology and empirical results. Subsequently, this chapter discusses linkage between capital flows and exchange rate in India and capital flows enhance the current account position with macroeconomic effect. This chapter also discusses the spillover effects of Fed rate on volatility of Indian financial market. Section IV, focus more about the impact of international capital flows on Indian financial market and economic growth. This chapter follows the literature review, snapshot of Indian stock market and journey of FPIs towards

economic growth, data and econometric Analysis, methodology and results and analysis. Fifth chapter summarizes the findings of the study and presents the conclusions of the study. In this chapter, we propose few policy recommendations. Lastly, it briefly discusses the limitation of the study, scope for further research and significant contribution to the existing literature.

Chapter 2

Review of Literature

2.1 Introduction

Since 1990's there has been an enormous growth in International capital flows towards developing countries. The integration of international financial markets necessitates an emergence of financial flows among the economies. Deeper integration into international financial markets can provide benefits in many ways, such as, access to foreign capital financing investment in different projects and thus increase economic growth. Capital flows often have positive externalities such as spill-over of managerial and technical know-how, especially in case of FPI. Capital inflows can have inflationary effects and increase the vulnerability of the economy's financial system. International capital flows are an important means of financing investment, it has become clear in the past decade that the sudden disappearance (or worse, reversal) of capital flows can result in a tremendous crisis (Calvo and Reinhart: 1998).

A major of economic reforms in India since 1991 has been a progressive liberalization of external capital flows. The non-debt flows such as Foreign Institutional Investment (FII) and Foreign Direct Investment (FDI) has led to surge of capital inflows and has strengthened the country's balance of payments situation. Capital flows are controlled by lot of controls and regulations. Such flows can be volatile and make the financial system vulnerable.

This chapter attempts to review the earlier literature into four sections:

1. Studies on the effect of foreign capital flows on financial market liquidity and returns among G20 countries.
2. Studies related to spillover effect of fed policy on Indian financial market efficiency.
3. Studies linking the puzzles of the Indian financial market through pull or push

approach.

4. Studies concerning the international capital flows behavior on the Indian financial market and economic growth.

2.2 Studies on the effect of foreign capital flow on financial market liquidity and returns among G20 countries.

Radelet and Sachs (1998), Kim and Wei (2002), Kaminsky, Lyons, and Schmukler (2004) have found, foreign investors are often alleged to exacerbate financial crises on local markets. Their study, diagnosis's of the financial crisis in Asia, focusing on the empirical record in the lead-up to the crisis. The main goal is to emphasize the role of financial panic as an essential element of the Asian crisis. At the core of the crisis were large-scale foreign capital inflows into financial system that became vulnerable to panic. The findings of the paper justifies the significant underlying problems and weak fundamentals besetting the Asian economies at both a macro-economic and a microeconomic level, the imbalances were not severe enough to warrant a financial crisis of the magnitude. They also find the withdrawal of foreign capital into a full -fledged financial panic.

Chari and Henry, 2004, Bekaert, Harvey, and Lumsdaine, (1999, 2002), Kim and Singal (2000).Moreover, the movements of foreign investors did not contribute to destabilizing the Korean stock market throughout the Asian financial crisis (Choe, Kho, and Stulz, 1999). Pastor and Stambaugh (2001) found that, the expected stock returns are cross-sectionally related to liquidity risk. This study investigates whether market-wide liquidity is a state variable important for asset pricing. They found that expected stock returns are related cross-sectionally to the sensitivities of returns to fluctuations in aggregate liquidity. They used monthly liquidity measure, an average of individual-stock measures estimated with daily data, relies on the principle that order flow induces greater return reversals when liquidity is lower. Over a 34-year period, the average return on stocks with high sensitivities to liquidity exceeds that for stocks with low sensitivities by 7.5% annually, adjusted for

exposures to the market return as well as size, value, and momentum factors.

Brennan and Cao (1997), Seasholes (2000), Ramadori (2001), Froot, O'connell, and Seasholes (2001), Choe, Kho, and Stulz (2001), and Bhattacharya, Daouk, Jorgenson, and Kehr (2000) have pointed out that foreign investors may be sophisticated and fail to gather private information at the time of local trading. They found shares trading in the Bolsa Mexicana de Valores do not seem to react to company news. They used a sample of Mexican corporate news announcements from the period July 1994 through June 1997. Their study reveals that there is nothing unusual about returns, volatility of returns, volume of trade or bid–ask spreads in the event window. They also provide evidence that, unrestricted insider trading causes prices to fully incorporate the information before its public release. The paper thus points towards a methodology for ranking emerging stock markets in terms of their market integrity, an approach that can be used with the limited data available in such markets.

In other words, the noise traders can improve the market liquidity by which they tend domestic market return as well. De Long, Shleifer, Summers and Waldmann (1990), and Kang and Stulz (1997), Choe, Kho, and Stulz (2005) have found that, domestic investors have an home bias informal advantage in countries like Japan, Korea, and Indonesia respectively. Moreover, to yield more return the sophisticated investors tries to enhance the foreign market liquidity. Therefore, investors can channelize some liquidity and gain some return out of the bad situation. Hendershott *et al.*, (2010) found that, algorithmic trading is general strategy by sophisticated investors, enhances liquidity on the New York Stock Exchange (NYSE). Market-maker balance sheet and income statement variables explain better time variation in liquidity and also they suggested liquidity-supplier financing constraints matter. Using 11 years of NYSE specialist inventory positions and trading revenues, we find that aggregate market-level and specialist firm-level spreads widen when specialists have large positions or lose money. The effects are nonlinear and most prominent when inventories are big or trading results have been particularly poor. These sensitivities

are smaller after specialist firm mergers, consistent with deep pockets easing financing constraints. Finally, compared to low volatility stocks, the liquidity of high volatility stocks is more sensitive to inventories and losses.

Choe *et al.*, (1999) found that, the evidence of herd behaviour of foreign investors on domestic market works for short-time period. Their study examined the impact of foreign investors on stock returns in Korea from November 30, 1996 to the end of 1997 using order and trade data. They found strong evidence of positive feedback trading and herding by foreign investors before the period of Korea's economic crisis. During the crisis period, herding falls, and positive feedback trading by foreign investors mostly disappears. They didn't find any evidence that, trades by foreign investors had a destabilizing effect on Korea's stock market over our sample period. In particular, the market adjusted quickly and efficiently to large sales by foreign investors, and these sales were not followed by negative abnormal returns. Blum *et al.,* (1989) found, S&P stocks declined at the time "Black Monday" due to heavy selling pressure as compared to non-S&P stocks. In case of India, investors face similar situation numerous times for a short time span. Whereas, Boyer *et al.*, (2006) found the presence of foreign investors in domestic market adds to the international spreading of stock market crisis consequences of domestic market liquidity. They provide empirical evidence that stock market crises are spread globally through asset holdings of international investors. By separating emerging market stocks into two categories, namely, those that are eligible for purchase by foreigners (accessible) and those that are not (inaccessible), they estimated and compare the degree to which accessible and inaccessible stock index returns co-move with crisis country index returns. Their results show greater co-movement during high volatility periods, especially for accessible stock index returns, suggesting that crises spread through the asset holdings of international investors rather than through changes in fundamentals.

2.3 Studies related to spill-over effect of fed policy on Indian financial market efficiency.

Lavigne, Sarker and Vasishtha (2014) discussed about different channels through which quantitative easing could affect capital flows, asset prices, interest rates, financial market conditions and economic activity in emerging market economies. The study found that the overall impact of QE on EMEs was likely positive because of the beneficial trade and confidence effects stemming from stronger economic activity in the countries adopting QE, which then spilled over to the rest of the world. And given the rising trend toward financial and trade integration, spillovers have likely to be increased between advanced economies and EMEs, underscoring the importance of communication among central banks to create a shared understanding of their policies and a better discussion of potential impacts.

Calvo and Reinhart (1996) found the evidence of spillover effect of December 1994 Mexican crisis on emerging market of Asia and Latin America. And also gave evidences of "large neighbor effects" in capital flows to and from Latin America during the past 25 years. The study further reveals that the degree of co-movement across weekly equity and Brady bond returns for emerging markets in Latin America increased in the wake of the Mexican crisis. Griffin, et.al (2003) used a theoretical model and empirical analysis to show that global stock return performance is an important factor in understanding equity flows. They took 9 markets from East Asia, South Asia and others from 1996 to 2001. With the use of VAR econometric model they found that foreign flows are the significant predictors of returns for Korea, Taiwan, Thailand and India, indicating that foreign investors are buying before market index increases. He also found that contemporaneous flows are positive and highly significant in India. FII and Stock Index show positive correlation.

Richards (2002) examined the impact of Foreign Institutional Investors on emerging equity markets. Their study concentrates on the post-crisis period from January 1999 to December 2001 with 5 variables (FPIs net purchase, Market capitalization, exchange rate, domestic bond yields and stock returns). The markets studied include the

Korea Stock Exchange, the Kosdaq Stock Market, the Taiwan Stock Exchange, the Philippine Stock Exchange, the Jakarta Stock Exchange, and the Stock Exchange of Thailand. From their study they found strong evidence of positive-feedback trading with respect to domestic, U.S., and regional equity returns. There is also strong contemporaneous correlation between equity returns and net inflows, which appears to primarily reflect price pressures from demand shocks. The estimated price impacts are far larger than earlier estimated value for emerging markets, although no larger than U.S. estimates of price impacts. Overall, the results suggest that foreign investors and external conditions have a more significant impact on emerging markets.

Lakonishok et al. (1998) applied strong evidence of positive feedback strategy followed by FPIs at the aggregate level on a daily basis. However, there is no evidence of positive feedback trading on a monthly basis. There are almost no dynamics between long horizon returns and net equity purchases. They specify, foreign investors have a tendency to herd on the Indian equity market even though they all may not repeat at the same time. In times of pressure in the stock market on account of a financial crisis in the region there is excessive selling side herding even through the extent of herding on the average and on either size of the market during a crisis may be lower than that in the immediate preceding period.

Agrawal (2010) investigated the causal relationship between Nifty and FPIs' net investment for the period January, 1999 to February, 2009 using daily data. He has divided the period into four phases on the basis of major global events. Nifty and FII are not normally distributed in all four phases. The Jarque-Bera (JB) and Anderson-Darling (AD) tests are used to test whether closing value of stock market and FII follow the normal probability distribution. Stationarity condition has been tested using Augmented Dickey Fuller (ADF) and Phillips- Perron (PP) tests. He found correlation between FII and Nifty was maximum in the bear phase as compared to all other phases. Granger Causality highlighted unidirectional relationship of Nifty over FPIs during each phase in the long run.

The Vector Auto-regression (VAR) by Sims (1980) has been estimated to capture short run causality between Nifty and FII investment Variance decomposition and impulse response functions determined the short term causal relationship which reveals that there was only positive unidirectional causality from Nifty to FPIs.

Sundaram (2009) investigated the causal relationship between stock return with respect to exchange rate and FII. He used three variables such as FII, INR and S & P Nifty from 1994 to 2008 with the help of Granger causality test. It also gives positive unidirectional Granger causality results i.e. stock returns Granger cause FII. No reverse causality is seen even after inserting a structural break in 2003. The study inferred that FII flows do not respond to short term changes or technical position of the market and they are more driven by fundamentals. He found that there was causality from FII to Nifty.

Batra (2003) attempted to develop an understanding of the dynamics of the trading behavior of FPIs and returns in the Indian equity market by analyzing daily data on FII equity purchases and sales and equity returns between January 2000 to December 2002 on the BSE Sensex and monthly data from January 1994 to December 2002. He examines three issues; firstly trading by FPIs reveals any trends of positive feedback trading secondly, the evidence of herding behavior by the FPIs and lastly the destabilizing impact, on stock prices in India. To test positive feedback strategy, he predicts a relation between the past performance of the market (as indicated by value of market index) and the current FII investment. Granger causality test is used to eliminate the possibility of a simultaneity bias in the model. In order to test stationarity both Augmented Dickey Fuller (ADF) and Philips - Perron (PP) tests are used. In case of Dynamic analysis, VAR system is used to analyze the impact of innovations in returns on trading imbalance. For this they specify the channels of causality using the standard "identification by ordering" methodology. The Impulse Response Functions (IRFs) allows tracing the time path of the impact of shocks on the variables contained in the VAR. From the analysis they found that there was the evidence of strong FPIs chasing trends and adopting positive feedback trading strategies at

the aggregate level on a daily basis. The results of their analysis also indicate that foreign investors have a tendency to herd together in their trading activity in India. The trading behavior and biases of the FPIs do not appear to have a destabilizing impact on the equity market.

Coondoo and Mukherjee (2002) studied the volatility of the day-to-day movements of foreign institutional investment (FII) in India, along with some other related variables like the stock market returns and the call money rate. Using time series of daily observations, for each of the six variables they have estimated these three measures for the entire sample period covering January 1999 to May 2002 and also for moving sample sub-periods of 15-, 30- and 90-day length. For the purpose of this study, a new technique of analysis has been used that defines and examines three different aspects of volatility, viz. strength, duration and persistence of volatility. The results suggest that the over-time movements of the daily values of FII and stock market returns contain a fair amount of volatility. Also, the strength and duration of volatility of stock market returns are more or less similar to those of the FII flows. Another interesting finding is that the strength of volatility of FII flows are positively correlated both with that of stock market returns and call money rate. They used regression analysis and Granger causality test for the study. The overall finding is that the FII and stock market returns in India exhibit quite high volatility in terms of both extent and duration. More importantly, there is also evidence which shows their volatility is interrelated.

Kohli (2003) examined the impact of capital flows upon the domestic financial sector. The study finds that an inflow of foreign capital has a significant impact on domestic money supply and stock market growth, liquidity and volatility. The banking sector, however, remains relatively insulated due to policy responses of the central bank and barriers to direct capital inflows into the banking system.

Kawai (2015) analyzed the impact of unconventional United States (US) and Japanese monetary policies on emerging economies. Finally the study suggests that the emerging economies that tend to experience large currency depreciations are those with large current account deficits, high public debt, and high inflation. Economies with sound macroeconomic fundamentals are usually little affected. The study also argued that the US monetary policy has had significant global spillover effects, particularly on emerging economies. Several emerging economy policymakers complained about the introduction of QE as a currency war and about the suggested tapering of QE as leading to capital outflows. The presence of economic interdependence between the US and the rest of the world suggests that, in changing its monetary policy stance, the Fed needs to pay attention to spillovers to the rest of the world as these could in turn impact back on the US. Now that QE has ended, the US Fed would be well-advised to take a cautious approach to further steps toward monetary policy normalization (through interest rate hikes, or asset sales, or both), while clarifying the conditions, speed and timeframe of policy normalization and communicating with the market effectively.

Chinn (2013) discussed the unconventional monetary policy affects the exchange rate and asset prices of emerging market economies. As a result the author stated that the advanced economies were able to implement expansionary monetary policy by conventional means – that is, by lowering the policy rate – similar complaints would arise. In other words, there are two issues at hand. The first is whether the accommodative monetary policy stance in advanced economies complicates stabilization policy in the emerging economies and developing countries. The second one, somewhat distinct from the first, is whether the resort to unconventional measures so complicates the choices faced by policymakers that such measures should be eschewed. To the extent that the policies, unconventional or otherwise, put upward pressure on the currencies of those countries that are near full employment, and/or have current account surpluses, the implementation of these measures are probably beneficial to the world economy. This is true, despite the fact that there is little coordination in the monetary policies being implemented in the United States, the Euro area, the UK and

Japan.

Anaya, Hachula and Offermanns (2015) empirically investigated the impact of US unconventional monetary policy on emerging market economies from the period of 2008 to 2014 by using Global Vector Auto Regression (GVAR) approach. And the results show that a U.S. UMP shock related to the Fed's large-scale asset purchases significantly increases portfolio outflows from the U.S. for almost six months. In the EMEs, this is associated with portfolio inflows. Along with the increase in inflows, real output growth and equity returns rise, the real exchange rate appreciates and the real lending rate decreases. Furthermore, regarding domestic monetary policy, the study finds that EMEs react by decreasing their policy rate in response to the U.S. shock, regardless of their exchange rate regime.

Chen, Mancini-Griffoli and Sahay (2014) focused on impact of US unconventional monetary policy on emerging market economies. And they found that unconventional monetary policies had larger spillovers per unit of surprise than conventional policies. The difference does not seem to stem from a change in the type of shocks (size, sign or turning points), nor from the effect of greater market volatility (uncertainty) during the UMP period. The reason seems to be more structural, tied to the particular instruments used during the UMP period, and perhaps to the liquidity that was created.

Fratzscher, Duca and Straub (2013) empirically analyzed the global spillovers of the Federal Reserve's unconventional monetary policy measures. The key result of the study suggests that QE1 policies during the first phase in 2008-2009 have triggered a substantial rebalancing in global portfolios, with investors shifting out of EMEs and other AEs and into US equity and bond funds. This led to a marked US dollar appreciation, while these Fed policies lowered US bond yields and supported equity markets. By contrast, Fed policies during the second phase in 2010 (QE2) induced a portfolio rebalancing in the opposite direction, pushing capital into EMEs. Importantly, these policies did not seem to have lowered sovereign yields, and have induced a marked depreciation of the US dollar.

Reflecting these concerns, the Group of 20 has put QE spillovers on its policy agenda (G-20 2013), with some members advocating a greater internalization of global spillover effects in the Federal Reserve's monetary policy decisions (Rajan, 2014).

2.4 Studies linking the puzzles of the Indian financial market through pull or push approach.

Cerutti, Claessens, and Puy (2015) analysed the behaviour of gross capital inflows across 34 emerging markets. The study finds that the cross-country differences in EM sensitivities to global push factors are, to a great extent, a function of market characteristics. In particular, the nature of a country's foreign investor base (the larger the role of international mutual funds in the case of equity and bond flows, and global banks in the case of bank inflows) explains the higher sensitivity of some EMs to global push factors.

Alfaro, Kalemli-Ozcan and Volosovych (2008) examined the role of different explanations for the lack of flows of capital from rich to poor countries. The study finds that variables such as government stability, bureaucratic quality, non-corruption, and law and order play a particularly important role in explaining the lack of flows to poor countries. A better institution is important not only to attract foreign capital but also to enable host economies to maximize the benefits of such investments.

According to Mohanty (2012), capital flows to emerging and developing economies depend on push factors emanating from low interest rate and lack of investment opportunity in advanced economies as well as by pull factors emanating from strong economic fundamentals and growth prospects in the recipient country. Particularly, stable flows like FDI are guided more by pull factors.

Fratzscher (2012) studied mainly push factors or pull factors which is the main drivers after the global capital flow for an extensive set of 50 developed and developing countries.The conclusions specify that collective shocks – such as specific crisis events,

changes to global liquidity and risk conditions – have exercised a substantial effect on global capital flows. Furthermore, the effects of such global issues have transformed definitely throughout the crisis. The rise in risk and important crisis events triggered a reallocation of flows from many emerging markets to some advanced market during the crisis, while they have had the contradictory effect before and after the crisis, consistent with a "flight-to-safety" hypothesis during the crisis. A highly argumentative subject is whether it is push factors i.e. shocks in advanced economies and common to all economies, or rather pull factors i.e. factors that are specific to countries themselves, which have been driving capital flows over the past few years. The results indicate that push factors in the form of shocks to liquidity and risk as well as to macroeconomic conditions and policies in advanced economies, in particular the US, have indeed exerted a significant effect on capital flows to EMEs as well as other advanced economies. Though these effects have been superior during the 2007-08 crises, they have sustained to apply a large effect on global capital flows also during the succeeding recovery.

Taylor and Sarno (1997) concentrated on the elements of the bulky portfolio flows from U.S to Latin American and Asian countries during 1988-92.Cointegration techniques disclose that both global and domestic factors elucidate bond and equity flows to emerging economies and signify substantial long-run elements of portfolio flows. The study also inspects the changing aspects of portfolio flows by approximating apparently unrelated error-correction models. Global and country-specific factors are similarly central in formative the long-run movements in equity flows for both Asian and Latin American countries, whereas worldwide issues are much more important than domestic factors in explaining the dynamics of bond flows. U.S. interest rates are a mostly significant cause of the short-run dynamics of portfolio, especially bond, flows to developing countries. A count of the number of significant push and pull factors appearing in the error-correction forms, classified by type of flow and geographic area, revealed that both seem to be equally important in determining short-run equity flows for Asian and Latin American countries.

Agénor (1998) used an inter-temporal optimizing model of a small open economy facing imperfect world capital markets to assess the effects of 'pull' and 'push' factors on capital flows, asset accumulation, and the real exchange rate. The swell in capital inflows to developing countries since the early 1990s has been attributed in the recent literature to the existence of both 'pull' (domestic) and 'push' (external) factors.

Montiel (1998) delivered a comprehensive indication of the current capital inflow incident experienced by a large group of emerging economies. As the study proposes that, capital inflows were determined by a mixture of push and pull factors, as well as by technological and institutional novelties in both creditor and debtor countries that expedited cross-border capital flows.

Kim, Kim, and Choi (2013) considered the issues of international capital flows in Korea during 1980-2010. In particular, they have explored the role of push (external) and pull (internal) factors in determining the magnitude and directions of overall capital flows and their components using a time-series analysis. The regression results show that external factors, specific world interest rate, meaningfully affect overall capital flows in Korea. Amongst internal factors, current account has significant and negative effects on capital flows. The estimated coefficients vary in different sub periods. In particular, the role of internal factors decreases over time. They also initiate that that portfolio investment is more sensitive to internal and external economic environments compared to direct investment.

Korap (2011) studied the factors of the portfolio based capital flows in the Turkish economy. Next the structural vector auto-regression methodology, the estimation results reveal that the 'push' factors based on the external developments for the Turkish economy have a foremost role in clarifying the behavior of the portfolio flows. Furthermore, the domestic real interest rate as one of the main 'pull' factors has been found in a negative dynamic relationship with the portfolio flows. This result is attributed to that the dynamic course of the portfolio flows should not be related to the excess return possibilities of the

real interest structure of the Turkish economy.

Richard *et al.* (2001) considered recent advances in the time-series analysis to examine the inter-temporal relation between stock indices and exchange rates for a sample of eight advanced economies. An Error Correction Model (ECM) of two variables was employed to simultaneously estimate the short-run and long-run dynamics of the variables. The ECM result revealed significant short-run and long-run relationship between the two financial markets. Specifically, the results show that increase in aggregate stock prices has negative short-run effect on domestic currency value. In the long-run, however, stock prices have positive effect on domestic currency value. On the other hand, currency depreciation has negative short-run and long-run effects on stock market.

Soumyen (2006) studied the surge in inflows has not been corresponding by a compatible growth in the absorptive capacity of the Indian economy. The foremost reason is the tenacious slowdown of industrial activity since 1997. At the same time, the Reserve Bank of India (RBI) has been hesitant to let the rupee bargain its market-clearing level under the surroundings. This has resulted in stable growth to our foreign exchange reserves (FER) over the last few years. Difficulties of foreign capital are broadening due to current account deficit, appreciation of real exchange, monetization, etc.

Badhani (2005) described the connection of FPI investment with stock prices on one hand and with exchange rate on the other hand with the objective that it may yield ancillary relation between exchange rate and stock prices. In the present-day Indian development, study on inter-linkage of stock prices, net FPI investment and exchange rate is scarce. Using monthly data from April 1993 to March 2004, he observed (i) bi-directional long-term causality between FII investment Flow and stock prices, but no short-term causality could be traced between the variables, (ii) no long- term relationship between exchange rate and stock prices, but short-term causality runs from change in exchange rate to stock returns, not vice versa, and (iii) exchange rate long term granger

causes FII investment flow, not vice-versa.

Rai and Bhanumurthy (2004) inspected the determinants of Foreign Institutional Investments (FII) in India, with the help of monthly data from January 1994 to November 2002. Stationarity tests have been carried out on all the variables as it is expected that monthly financial variables contain unit root. By using Augmented Dickey-Fuller test, they found that FII inflow depends on stock market returns, inflation rate (both domestic and foreign) and ex-ante risk. They use ARMA model to estimate ex ante risk for predicting the SDBR and SDSR. In terms of magnitude, the impact of stock market returns and the ex-ante risk turned out to be major determinants of FII inflow. In FII model, they regress FII on IND, INF, RBSE, RSP, SDBRF and SDSRF. However, Breusch-Godfrey Serial Correlation LM test shows the presence of autocorrelation in the model, hence model is re-estimated correcting for autocorrelation. In the re-estimated model there was presence of ARCH effect, hence ARCH (1) model is tried, but diagnostic tests indicated the need to include more lags. Hence GARCH (1, 1) is tried. Then to account for the possible presence of asymmetry TARCH is estimated.

Khanna (2002) examined the macroeconomic impact on Indian capital market as well as the corporate sector and what are the macro economic effects on inflows of capital to Indian and micro economic effects on the capital market during 1989 to 2002. He took the macro variable as FDI, FPI, NRI deposits, external assistance and GDP/GDS/GNP. He pointed out that entry of international capital flows helps to provide greater depth to the domestic capital market and reduce the systematic risk of the economy. He argues that advanced for liberalizing capital market and opening them to foreign investor are to increase the availability of capital with domestic industries and commercial firms. On the other hand, the Indian stock market today is largely dominated by a small group of FII's, which are able to move the market by large interventions.

Chakraborty (2001) tried to gain a better understanding of the nature and determinants of FII

flows. Towards this end he first takes a look at the FII investment flows data. Next he studied the relationship between FII flows and the stock market returns in India from 1993 to 1999 with a close look at the issue of causality. In all of these investigations he makes a distinction between the pre-Asian crisis period and the post-Asian crisis period to check if there was a regime shift in the relationships owing to the Asian crisis. He employed regression, correlation and Granger causality test for his study. He found that while the flows are highly correlated with equity returns in India, they are more likely to be the effect than the cause of these returns; and the FPIs do not seem to be at an informational disadvantage in India compared to the local investors. Also he pointed out that the Asian Crisis marked a regime shift in the determinants of FII flows to India with the domestic equity returns becoming the sole driver of these flows since the crisis.

2.5 Studies concerning the international capital flows behavior on the Indian financial market and economic growth.

There has been a lot of discussion on macroeconomic variables and stock returns but very limited studies exist in relation to macro-economy and FPIs context of Indian economy. Levine and Zervos (1996) are among those few studies which considered the relationship between stock market development and economic growth. The study uses pooled cross-country time series data on 41 countries over the period 1976-1993. The paper uses an aggregate index of overall stock market development constructed by Demirguc-Kunt and Levine (1996b) which combines information on stock market size, liquidity and integration with world capital markets. While assessing the relationship between stock market development and economic growth the paper includes a large number of control variables. Using the instrumental variable method of estimation, the study observes that the stock market development is positively correlated with economic growth even after controlling for other factors associated with long-run growth.

Singh (1997) argued that stock market development was unlikely to help in achieving quicker industrialization and faster long-term economic growth in most

developing countries. Three reasons are cited. First, the inherent volatility and arbitrariness of the stock market pricing process under developing country conditions make a poor guide to efficient investment allocation. Second, the interactions between the stock and currency markets in the wake of un-favorable economic shocks may exacerbate macroeconomic instability and reduce long-term growth. Third, stock market development is likely to undermine the existing group-banking systems in developing countries, which, despite their many difficulties, have not been without merit in several countries, not least in the highly successful East Asian economies.

Pal (1998) examines whether the Indian economy has actually benefited from the huge influx of the foreign institutional investment (FII) during the period 1990 to1997 as taking into the variables equity, debenture, bond and preferences etc. He finds that, instead of lifting the level of domestic saving and investment, financial liberalization in general has rather increased financial instability. Gupta *et al* (2000) examined the relationship between interest rate, exchange rate and stock price in Jakarta stock exchange and identified sporadic unidirectional causality from closing stock prices to interest rates and weak unidirectional causality from exchange rate to stock prices. They felt that the Jakarta market is efficiently incorporated much of the interest rate and exchange rate information in its price changes at closing stock market index.

Richard. *et.al* (2001) studies recent advances in the time-series analysis to examine the inter-temporal relation between stock indices and exchange rates for a sample of eight advanced economies. The ECM result revealed significant short-run and long-run relationship between two financial markets. Specifically, the results show that increase in aggregate stock prices has negative short-run effect on domestic currency value. In the long-run, however, stock prices have positive effect on domestic currency value. On the other hand, currency depreciation has negative short-run and long-run effects on stock market. Campbell *et al*. (2001) found that stock market volatility has significant forecasting power for real gross domestic product growth. Morgan (2002) studies shows FII strongly influence

short-term market movements during bear markets. However, the correlation between returns and flows reduces during bull markets as other market participants raise their involvement reducing the influence of FPIs.

Khanna (2002) argues that advanced for liberalizing capital market and opening them to foreign investor are to increase the availability of capital with domestic industries and commercial firms. On the other hand, the Indian stock market is today largely dominated by a small group of FII's, are able to move the market by large intervened. Rai and Bhanumurthy (2004) inspect the determinants of Foreign Institutional Investments (FII) in India, with the help of monthly data from January 1994 to November 2002. They examine whether return and risk in the stock market and other real factors have any impact on the FPIs inflow into the country. Singh (2005) examined the effect of significant macroeconomic variables, inflation and exchange rate on the inflows of FII in India, and also tried to develop a theoretical framework to analyze such inter-relationship. He found adverse impact between the variables.

Badhani (2005) explains the relationship of FII investment with stock prices on the one hand, and with exchange rate on the other hand may produce indirect relation between exchange rate and stock prices. He observed (i) bi-directional long-term causality between FII investment Flow and stock prices, but no short-term causality could be traced between the variables, (ii) no long-term relationship between exchange rate and stock prices, but short-term causality runs from change in exchange rate to stock returns, not vice versa, and (iii) exchange rate long term granger causes FII investment flow, not vice versa. Ananthanarayanan *et al*.(2009) observed that unexpected flows of FPIs have a greater impact on stock indices than expected; and found no evidence that FPIs employ either momentum or contrarian strategies. Reddy (2010) studied the movements in BSE Sensex in relation to FII investments and identified that FPIs were the significant factor determining the liquidity and volatility in the stock market prices.

Wang (2010) found evidence that there was a bilateral relationship between inflation and stock prices, while a unidirectional relationship exists from stock prices to the interest rate. But no significant relationship between stock prices and real GDP was found. Naik and Padhi (2012) observed bidirectional causality between industrial production and stock prices, unidirectional causality from money supply to stock price, stock price to inflation and interest rates to stock prices. The authors conclude that macroeconomic variables and the stock market index are co-integrated and, hence, a long-run equilibrium relationship exists between them. Mohapatra and Panda (2012) correlated top ten rises and top ten falls of Sensex with corresponding net flows of FPIs and also tested the impact of other macroeconomic factors along with FPIs affecting Sensex for a 10-year period and found that IIP and Exchange rate (INR/USD) have a higher influence than FPIs on the stock markets.

There are various ways in which the short-run relationship between the stock market and the macro economy has been modeled in the literature. We conclude this section with brief account of the limited literature on the FPIs, output-stock-price relationship in India. In the literature which deal with our topic although there appears to be some confusion between output and growth, with several papers claiming to be an analysis of stock prices and economic growth but actually analyzing the relationship between stock prices and GDP (often both in levels) so that they are directly relevant to the work reported in this chapter. This study attempts to analyze the impact of foreign capital flows into India following its entrant to Indian market in 1992, in the context of the Foreign Institutional Investments. These study generally test for stationary and cointegration in the (logs of) FPIs net investment, stock prices and macro variables, principally output, and then go on to test for causality between them. The latter of which focuses on REER, exchange rate and stock prices and decomposes FPIs shocks into supply and demand-driven ones which, it is found, have different effects on stock prices.

Chapter 3

Data and Methodology

3.1 Introduction

The discussion in the preceding chapter reveals that there is an emergence of empirical consensus on an unswerving relationship between International capital flows, monetary policy, global economy and macroeconomic variables. Similarly, no conclusive generalization can be made about the casual relationship among International capital inflows and economic growth without empirical analysis. This chapter discusses the tools and technique of time series analysis according to the objectives. This chapter focuses all the details about the econometric methodology. We attempt to understand if the observed fluctuations in the time-series of some macroeconomic variables viz., interest rate, wholesale price index, exchange rates and foreign exchange reserve as reported theoretically in the earlier chapter, can be explained in relation to the fluctuations in the time series of inflows of foreign capital. Previous research shows that before indulging in any econometric model using time-series data, one should be concerned about the problem of non-stationarity or unit root problem. Results from a regression exercise involving non-stationary data is observed to be spurious (Granger and Newbold, 1974 and Granger, 1981). Therefore, the present chapter includes the recent developments in the econometric time series analysis.

The chapter is organized into three sections including first one introduction. In section 3.2, we describe the description of variables and data. In section 3.3, we discuss the methodology and time series econometric tests used in the study of this chapter, which includes PMG/ ARDL, Cross-country analysis, FMOLS/DOLS, GARCH (p,q), vector auto-regression (VAR), VECM (Vector error correction model), Engel-Granger (1987) two step

procedure, Granger's (1969) casualty test, and other important extensions of these models as used.

3.2 Description of the Data

This study examines the effect of international capital flows on Indian financial market by analyzing following parameters of Indian financial market i.e. liquidity, Index returns and market efficiency.

3.2.1 Flow Measures and Screens

Consistent with the approach adopted in Froot*et al.,* (2001), Bekaert*et al*., (2002), and Griffin *et al.* (2004), we scaled net portfolio flows by the aggregate local market capitalization. We calculate net equity portfolio inflows by using this formula;

$$FLOW_{i,t} = \frac{F_{i,t}^{buy} - F_{i,t}^{sell}}{MCAP_{i,t}} \quad (3.1)$$

Where,

$FLOW_{k,t}$ is the net equity inflow from the U.S. to country i in month t,

$F_{i,t}^{buy}$ Signifies the gross purchase by the U.S. investors of equity in country i in month t,

$F_{i,t}^{sell}$ Signifies the gross sales by the U.S. investors of equity in country i in month and

$MCAP_{i,t}$ is the aggregate of all stocks market capitalization at the end of month t of i country.

As Ferreira and Matos (2008) reported that total foreign institution held outside U.S. is of 13.5% of the local equity market capitalization and half of the U.S. institution accounted for this fraction. So we calculate the net equity inflow as aggregate gross purchases of U.S. equity by foreigners from U.S. investors minus gross sales of U.S. equity by foreigners from the remaining 19 countries, scaled by aggregate U.S. market capitalization.

3.2.2 Determinants of Liquidity Dimensions

Brunnermeier and Pedersen (2009) defined asset liquidity as the ease with which it is traded. The literature has developed a number of different measures of liquidity, but there is no universally accepted or appropriate definition of liquidity. From the prior literature we find, most of the studies mentioned about the effective bid-ask spread and market impact transaction. We have adopted the Amihud (2002) price impact measure as a proxy of liquidity. The basic idea of Amihud proxy is to capture the marginal price impact on market liquidity and returns. Prior literature such as Avramov, Chordia, and Goyal (2006), Hasbrouck (2006), Acharya and Pedersen (2005), Spiegel and Wang (2005), Korajczyk and Sadka (2008), Kamara, Lou, and Sadka (2008), Goyenko, Holden, and Trzcinka (2009), Karolyi et al. (2009) and Gabrielsen *et al.* (2011) support us to use this proxy to measure stock market liquidity.

We follow the studies of both Karolyi*et et al.* (2009) and Gabrielsen *et al.* (2011). We have taken the logarithmic transformation of one plus the Amihud liquidity proxy. Such as;

$$LIQ_{i,d} = -log\left(1 + \frac{|R_{i,d}|}{P_{i,d}V_{i,d}}\right) \quad (3.2)$$

Then, we multiply the result by -1 to get a specific measure of liquidity. In the above equation $LIQ_{i,d}$ represents the Amihud liquidity proxy, $R_{i,d}$is the return, $P_{i,d}$is the adjusted closing prices and $V_{i,d}$ is the ith stock trading value on the d day. We employ four step methods to avoid reporting error in the dataset. First, we follow Karolyi*et al*. (2009) to identification of non-trading days or zero trading days in a month. Second step is to exclude the days with 80% more zero trading days from the respective month. Third, we follow Ince and Porter (2006) and set daily return to missing value for the total return index for either the previous or the current day is below 0.01. We construct monthly time series of market liquidity series for each country with equally weighted U.S. dollar instead of local currency.

3.2.3 Market Returns

We create monthly return index and price series by taking the end-of month values and price series from the daily adjusted closing prices. We again follow the Ince and porter (2006) screen, which satisfies the following condition:

$$(1 + R_{i,t})(1 + R_{i,t-1}) \leq 1.5, \quad (3.3)$$

Where $R_{i,t}$ and $R_{i,t-1}$ are the total stock index of exchange i in the month t and t-1 respectively, among these two at least one should be greater than 300%. We construct monthly time series of market Index return series for each country with equally weighted U.S. dollar instead of local currency. Finally, we limit the effect of outliers in our monthly time-series by winsorization[4] the values that fall below bottom 1% and above the top 99% of the distribution respectively.

3.2.4 Market Efficiency

The efficiency of domestic stock market, we calculated by following the World Bank (1999) report suggested as domestic stock market turnover ratio. It can be termed as the ratio of the value of the total shares traded to market capitalization.

[4]Winsorized means are robust estimators of the population mean that are relatively insensitive to the outlying values. Therefore, Winsorization is methods for reducing the effects of extreme values in the sample. The *k*-times Winsorized mean is calculated as: $\bar{y}_{wk} = \frac{1}{n}\left\{(K+1)y_{(k+1)} + \sum_{i=k+2}^{n-k-1} y_{(i)} + (k+1)y_{(n-k)}\right\}$

A robust estimate of the variance of the trimmed mean $\acute{Y}_{wk}$ can be based on the Winsorized sum of squared deviations (Tukey and McLaughlin 1963). The Winsorized mean is computed after the *k* smallest observations are replaced by the (*k*+1) st smallest observation, and the *k* largest observations are replaced by the (*k*+1)st largest observation. In other words, the observations are Winsorized at each end. For a symmetric distribution, the symmetrically trimmed or Winsorized mean is an unbiased estimate of the population mean (n). But the trimmed or Winsorized mean does not have a normal distribution even if the data are from a normal population.

3.3 Methodology of the Study

Firstly, in order to examine examines the effect of foreign capital flows on financial market liquidity and returns in selected G20 countries. We have tested panel unit root test by using Pedroni and Kao's cointegration test to identify the existing co-integrating vector among variables for our first objective. We have also used Fully Modified Ordinary Least Square Method (FMOLS) and Dynamic Ordinary Least Square (DOLS) to find out the elasticity estimation of the variables. The effects of international capital flows on financial market liquidity and returns in selected G20 countries has been tasted by using the pooled mean group / Autoregressive distributed lag order (PMG/ARDL) model. Following the result, cross-country analysis explains the snapshot of individual country relation between liquidity, market return and stock market return. Further, this chapter discusses economic significance of the present study with appropriate econometric tools.

Secondly, discusses the spillover effect of Fed policy on Indian financial market efficiency and international capital flows. To examine the effect of volatility of international capital flows and U.S Fed policy rate on India's stock market efficiency the study makes use of regression analysis generating volatility series through Generalized Autoregressive Conditional Heteroskedasticity (GARCH 1.1) process. First, we have employed VECM approach to analyze the spillover effect of U.S monetary policy (Fed Rate) on Indian financial market approach, then we analyzed, whether the spill-over effect directly create volatility on the domestic financial market or not by using GARCH-M model.

Thirdly, to identify the puzzles of the Indian financial market through pull or push approach. In this study, Fed rate may justify Push factor approach and all the four macroeconomic variables used as a proxy for Pull factor. Firstly, in order to examine the effect of private foreign capital out flows on macroeconomic variables namely, wholesale price index, exchange rate, rate of interest, policy rate, Vector Autoregressive (VAR) method, impulse response function and variance decomposition technique are employed to

examine the short-term dynamics and casual relationship between variables. Before estimating the VAR model, the unit root tests examine the stationary properties of the variables. In this study two unit root tests, viz. Augmented Dickey Fuller (ADF) tests and Phillip Perron's (PP) test have been conducted to examine the stationarity properties of the variables.

Finally, to examine the impact of international capital flows on Indian financial market and economic growth. We have analysed the relationship between FPIs, stock market and macro-economy in India since the FPIs investment in Indian stock market. The Johansen- Juselius co-integration test clearly points out the existence of a positive long-run relationship from stock prices, macro-economy to foreign institutional investment including output or growth.

3.3.1 Panel Unit-root Tests

The panel unit-root is considered as better than normal unit-root tests since it incorporates the cross-section data. In order to increase the influence of univariate unit root test, we have used panel unit root tests, which are alienated into "first generation panel unit root tests" including Levin–Lin–Chu (LLC) test (Levin *et al*., 2002), Im–Pesaran–Shin (IPS) test (Im *et al.*, 2003), MW test (Maddala and Wu, 1999) and Choi test (Choi, 2001) and the "second generation panel unit root tests" containing MP test (Moon and Perron, 2004), Pesaran test (Pesaran, 2007) and Choi test (Choi, 2006). First generation tests do not allow for cross-sectional dependence between units; however, second generation tests take into account the cross sectional dependency. The first and second generation tests which do not allow for the structural breaks may suffer from significant loss of power if data display possible breaks. Khraief *et al.*, 2015 suggests using Lagrange Multiplier (LM) panel unit root test developed by Im, Lee and Tieslau (2005). The LLC test (Levin *et al.*, 2002) allows for *homogeneity* of the first order autoregressive parameters and the cross sectional independence between units and suggests the following adjusted *t* statistic:

$$t_p^* = \frac{t_p}{\sigma_T^*} - NTS_N\left(\frac{\hat{\sigma}_{\hat{\rho}}}{\hat{\sigma}_\varepsilon^2}\right)\left(\frac{\mu_T^*}{\sigma_T^*}\right) \qquad (3.4)$$

Where $\hat{S}_N$represents the average of individual ratios of long-run towards short-run variances for individual i. $\hat{\sigma}_{\hat{\rho}}$ and $\hat{\sigma}_{\hat{\varepsilon}}^2$ are the standard deviations of slope coefficient and error term respectively. We follow Levine, Lin, and Chu (2002) for the mean adjustmentμ_T^* and the standard deviation adjustment σ_T^* for various T periods.

The IPS (Im, Pesaran and Shin, 2003) test assumes heterogeneity of the first order autoregressive parameters and employs a standardized *t_ bar* statistic based on the limiting distribution of individual ADF statistics:

$$Z_{t\,bar}(\rho;\beta) = \frac{\sqrt{N}[t\_bar_{NT} - E(t_{iT})]}{\sqrt{V(t_{iT})}} \qquad (3.5)$$

Where$E(t_{iT})$and $V(t_{iT})$are respectively represent the expected mean and variance of the t statistics (t_{iT}).

Following Maddala and Wu, (1999) which uses Fisher type test (1932) is based on combined p-values p_i or $P_{MW,\,from}$ unit root test-statistics for each cross-sectional unit *i*. The MW test (Maddala and Wu, 1999) proposed the statistics as: $\mathbf{P}_{MW} = -2\sum_{i=1}^{n}\ln(p_i)$ which has a χ^2 distribution with 2N degrees of freedom as T→ ∞ and N Fixed. This test was suggested by Fisher (1932). In addition, Choi (2006) suggested the following standardized statistic:

$$\mathbf{MW} = \frac{\sqrt{N}[N^{-1}p_{MW} - E\,[-2\ln(p_i)]]}{\sqrt{V\,[-2\,\ln(p_i)]}} \qquad (3.6)$$

$$u_{i,t} = \delta'_i F_t + e_{i,t} \qquad (3.7)$$

For i =1,...,*N*and$t$ =1,...,T . Ft is a (k ×1) vector of common factors, δ*i* s the coefficients vector corresponding to the common factors and *i*,*t e* is an idiosyncratic error-term which is cross-sectionally uncorrelated and follows an infinite Moving Average(MA) process. The null hypothesis corresponds to the unit root hypothesis H0: λ*i* = 1for*i*=1,...,*N c* against the heterogeneous alternative hypothesis H1: λ*i*<1for some *i*. For testing, the data are de-factored and then the panel unit root test statistics based on de-factored data are

proposed.

In Pesaran's test (2007), the study proposes to augment the cross-sectional unit *ADF* (p_i) regressions by cross-sectional means of lagged levels and first-differences of the individual time series. The cross-sectionally augmented *ADF* regressions are given by:

$$\Delta y_{i,t} = \alpha_i + \rho_i y_{i,t-1} + C_i\left[(1/N)\sum_{i=1}^{N} y_{i,t-1}\right] + d_i\left[(1/N)\sum_{i=1}^{N} \Delta y_{i,t}\right] + \varepsilon_{i,t} \qquad (3.8)$$

Pesaran (2007) suggested the following truncated test statistics which is denoted as a *Cross-Sectional Augmented IPS (CIPS)*:

$$CIPS(N,T) = \frac{1}{N}\sum_{i=1}^{N} t_i\,(N,T) \qquad (3.9)$$

Where $t_i\ (N,T)$ the t-statistic of the OLS estimates of is *pi* (denoted as CADF). The Pesaran test statistic is the modified IPS statistics based on average of individual CADF. The next panel unit root test is the Choi, (2006) test which combines p-values of Augmented Dickey-Fuller univariate tests. In first step, the panel unit root tests of Choi (2006) use Elliott *et al.* (1996) GLS de-trending, to eliminate the cross-sectional correlations and controlling for the deterministic trends. In second step, meta-analytic panel tests are used. Choi (2006) assumes the following two-way error-component model:

$$y_{i,t} = \alpha_i + \theta_t + u_{i,t}$$

$$u_{i,t} = \sum_{j=1}^{p_i} d_{i,j} u_{i,t-1} + \varepsilon_{i,t} \qquad (3.10)$$

Where $\varepsilon_{i,t}$ is i.i.d$(0,\sigma_{\varepsilon_i}^2)$. After obtaining the p-values of t-statistics, Choi (2006) combined these into panel test (Fisher's type) statistics as follows:

$$P_m = -\frac{1}{\sqrt{N}}\sum_{i=1}^{N}[\ln(p_i) + 1] \xrightarrow[T,N\to\infty]{} N(0,1) \qquad (3.11)$$

$$Z = -\frac{1}{\sqrt{N}}\sum_{i=1}^{N} \emptyset^{-1}(p_i) \xrightarrow[T,N\to\infty]{} N(0,1) \qquad (3.12)$$

$$\mathbf{L}^{*} = -\frac{1}{\sqrt{\pi^{2} N/3}} \sum_{i=1}^{N} N \ln\left(\frac{p_i}{1-p_i}\right) \xrightarrow[T,N \to \infty]{} N(0,1) \quad (3.13)$$

Where, $\emptyset$ is the standard cumulative normal distribution function and *pi* is the asymptotic p-values of the Dickey-Fuller-GLS statistic for country *i*.

3.3.2 Panel Co-integration

The model of co-integration has been extensively used in the time series literature to test the existence of long run associations among variables. According to Engle and Granger (1987), if two or more non-stationary variables with the same order of integration have a linear combination with a lower order of integration then cointegration exists between the variables. For instance, if both foreign capital flows, liquidity and return are I(1) and a linear combination of them is I(0), one can conclude that the dependent and independent variables are cointegrated and form a long run relationship in the sense that the discrepancy between the two variables is not an ever growing amount, namely it is stationary in the long-run.

Like, individual unit root tests, cointegration tests in the time series literature experienced low power at short time horizon. A panel technique is better in detecting cointegration relationships, as it unites cross-sectional and time series information in the data when estimating co-integrating coefficients.

Kao (1999), and Pedroni (1999, 2004) proposed panel cointegration tests related to the Engle and Granger (1987) framework, which includes testing the stationarity of the residuals from a levels regression. Kao's test is based on the following model:

$$y_{it} = \alpha_i + \beta x_{it} + e_{it} \quad (3.14)$$

$$y_{it} = y_{it-1} + u_{it} \quad (3.15)$$

$$x_{it} = x_{it-1} + v_{it} \quad (3.16)$$

Where i= 1,……,N and t= 1,…….., T, v_i denotes individual intercepts, is the common slope

across I, e_{it} is error term and both y_{it} and x_{it} contain a unit root[5]. Kao's test is designed to find whether y_{it} and x_{it} are co-integrated.

Pedroni (1999, 2004) develops an alternative residual based cointegration test under the null of no cointegration for heterogeneous panels. Pedroni's test differs from Kao's test in the sense that it assumes *p*to be heterogeneous across cross-sections in Equation (3.17).

$$\hat{e}_{it} = \rho \hat{e}_{i,t-1} + \sum_{j=1}^{p} \gamma_j \Delta \hat{e}_{i,t-1} + v_{itp} \qquad (3.17)$$

The test statistic is based on calculating cointegration test statistics for each cross section independently. Average them to find a cointegration test for the entire panel so that it performs well if the sample size has a sufficiently large time dimension for each cross-section.

3.3.3 Long run Estimation Approach

In the co-integrated panels, using the ordinary least squares (OLS) method to estimate the long-run equation leads to a biased estimator of the parameters unless the regressors are strictly exogenous, so that the OLS estimators cannot generally be used for valid inference. Pedroni (2000) proposes fully modified ordinary least square (FMOLS) estimation while Kao and Chiang (2000) and Mark and Sul (2001) recommend the dynamic ordinary least squares (DOLS) as alternative methods of panel cointegration estimation.

FMOLS estimation corrects for endogeneity and serial correlation to the OLS estimator. It helps to correct the endogeneity bias and obtain an unbiased estimator of the long-run parameters. DOLS uses a parametric adjustment to the errors by augmenting the static regression with leads, lags, and contemporaneous values of the regressors in first

[5] Kao (1999) also checks the test results when a time trend is added to Equation (3) but his simulations show that asymptotic variances are different compared to model without a trend.

differences. Both FMOLS and DOLS provide consistent estimates of standard errors that can be used for inference. According to Kao and Chiang (2000), FMOLS and DOLS estimators have normal limiting properties, and the DOLS estimator outperforms the FMOLS estimator in small samples. DOLS estimation is given in the following equation:

$$FLOW_{i,t} = \alpha_i + LIQ_{i,t}\beta + \sum_{j=-q}^{q} C_j \Delta LIQ_{i,t+j} + RTURN_{i,t}\gamma + \sum_{j=q}^{q} \vartheta_j \Delta RTURN_{i,t+j} + \varepsilon_{i,t} \quad (3.18)$$

Where$i$ = 1, …… N and t =1, …….T , β *and* γ are homogenous coefficient across cross-sections, $\alpha_i$are individual fixed effects, $\varepsilon_{i,t}$ is the error terms and q represents the number of leads lags of the first differenced liquidity and return variables. When using panel data estimation, choosing between fixed effects and random effects is crucial.

3.3.4 Testing for a Unit Root

One fundamental condition for the existence of cointegration is that, all the variables must be integrated of the same order. Therefore, first of all we will test whether all the series are stationary or not. In the economic practice, two tests have been widely used to determine the order of integration: The Augmented Dickey Fuller Test developed by Dickey and Fuller (1979) as well as the Phillips-Perron test (Phillips and Perron, 1988). The Augmented Dickey Fuller (ADF) test allows testing for a unit root in the presence of autocorrelation in the error terms. Another popular unit root test is the Phillips-Perron (PP) test (Phillips and Perron, 1988). The PP test differs from the ADF test mainly in how it deals with auto-correlated and heteroskedastic error terms.

3.3.4.1 Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) Tests

Dickey and Fuller (1979) consider three different regression equations that can be used to test the presence of a unit root:

$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t \quad (3.19)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t \quad (3.20)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_2 t + \varepsilon_t \quad (3.21)$$

In the above equations, the difference between the three regressions concerns the presence of the deterministic elements α_0, $\alpha_2 t$. The first is a pure random walk model, the seconds adds an interceptor drift term, and the third equation includes both a drift and linear time trend. The parameter of interest in all the regression equation is γ; if $\gamma = 0$, the $\{Y_t\}$ sequence contains a unit root. The test involves estimating one or more of the equations above using OLS in order to obtain the estimated value of γ and associated standard error. Comparing the resulting t-statistic with the appropriate value reported in the Dickey Fuller tables allows us to determine whether to accept or reject the null hypothesis $\gamma = 0$.

In conducting Dickey Fuller test as in Equations 3.19, 3.20 and 3.21, it was assumed that the error term ε_t was uncorrelated. But when the assumption of uncorrelated error term is ε_t is relaxed, Dickey and Fuller have developed another test of unit root which is known as the Augmented Dickey Fuller (ADF) test, where the lagged difference terms of the variable are included in the model to make the error term serially independent. This test is conducted by 'augmenting' the preceding three equations such as 3.19, 3.20 and 3.21 by adding the lagged values of the independent variable ΔY_t. The ADF test may be specified as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i-1}^{k} \beta_i Y_{t-i} + \varepsilon_t \quad (3.22)$$

Where ε_t is a pure white noise error term and where Δ is difference operator, γ and β are the parameters.

In ADF test we still test whether $\gamma = 0$ and the ADF test follows the same asymptotic distribution as the DF statistics, so the same critical values can be used. It is worth while pointing out that the appropriate static to be used depends on the deterministic components included in the regression equation. When there is no intercept and trend, we use τ statistic;

with only the intercept, use the τ_μ statistic; and with both an intercept and trend, use τ_τ statistic. The statistics labeled τ, τ_μ and τ_τ are the appropriate statistics to be used in 3.19, 3.20 and 3.21 respectively. The DF test forms a special case of the ADF test when the summation part in the right hand side of Equation 3.22 is detected or when K = 0 [Dickey Fuller (1979)]. For ADF test, the value of K is determined, based on the Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC).

One advantage of ADF is that it corrects for higher order serial correlation by adding lagged difference term on the right hand side. If the simple unit root test is valid only if the series is an *AR(1)* process. One of the important assumptions of DF test is that error terms are uncorrelated, homoscedastic as well as identically and independently distributed (iid).

3.3.5 Cointegration Test

In order to avoid the problem of spurious regression which arise due to the non-stationary nature of the data in time series analysis, cointegration technique came to the rescue. Thus, when the variables contain a unit root, modern time series techniques of cointegration are used to establish long run equilibrium relationship between the private foreign capital flows with macroeconomic variables including economic growth. In general, cointegration is defined as the long run equilibrium relationship among the set of non-stationarity variables provided their linear combination is found to be stationary. A principal feature of cointegrated variables is that their time paths are influenced by any extent of any deviations from long run equilibrium relationship. After all, if the system is to return to equilibrium, the movement of at least some of the variables must respond to the magnitude of disequilibrium. Our study uses two methods of testing for cointegration namely, Johansen-Juselius multivariate cointegration technique to test for cointegration and long-run equilibrium relationship among the macroeconomic variables including economic growth and Engel-Granger (1987) two step procedures which are discussed below.

The cointegration method is applied to a wide variety of economic models.

Cointegration tests examine the possible existence of a long-run equilibrium relationship between two or more variables, which must be integrated of the same order. Any equilibrium relationship among a set of non-stationary variables implies that their stochastic trends must be linked. After all, the equilibrium relationship means that the variables cannot move independently of each other. This linkage among the stochastic trends necessitates that the variables be cointegrated. Since the trends of cointegrated variables are linked, the dynamic paths of such variables must bear some relation to the current deviation from the equilibrium relationship. Thus, the conventional wisdom of differencing all non-stationary variables used in a regression analysis was- incorrect.

There are two main approaches to test for cointegration. They are Engle and Granger (1987) two step procedure and the Johansen and Juselius (1990) procedure. Though the Engle-Granger (1987) cointegration procedure is easy to implement, but it is not free from limitations. The estimation of the long run equilibrium regression requires that the researcher place one variable on the left hand side and use the others as regressors. In practice, it is possible to find that one regression indicates the variables are cointegrated whereas reversing the order indicates no cointegration. This is a very undesirable feature of the procedure since the test for cointegration should be invariant to the choice of the variable selected for normalization. Moreover, in tests using three or more variables, we know that there may be more than one co-integrating vector. The method has no systematic procedure for the separate estimation of the multiple co-integrating vectors. Another limitation of the Engle-Granger procedure is that it relies on a two-step estimator. Hence, if any error introduced by the researcher in first step is carried into second step.

3.3.5.1 Engle-Granger Two Step Procedure

Engel-Granger (1987) procedure is employed to detect the presence of long run equilibrium relationship between two or more variables in a single equations system. The equilibrium relationship means that the variables cannot move independently of each other. However, Engel Granger procedure necessitates that the variables must be integrated of same order. To

check the order of integration among the variables, various test such as DF and ADF tests are to be employed, which are discussed earlier. If a series is differentiated, 'd' times before it gets stationary, then it is said to be integrated of order 'd' and denoted I(d).

Engel and Granger's (1987) formal analysis begins by considering a set of economic variables in long run equilibrium when $\beta_1 x_{1t} + \beta x_{2t} + \ldots\ldots + \beta_n x_{nt} = 0$. If we let β and x_t denote the vectors $(\beta_1, \beta_{2\ldots} \beta_n)$ and $(x_{1t}, x_{2t} \ldots x_{nt})$, the system is in long run equilibrium when $\beta x_t = 0$. The deviation from long run equilibrium is called the equilibrium error i.e. $e_t = \beta x_t$. If the equilibrium is meaningful, it may be the case that the equilibrium error process is stationary. As per the Engel Granger's methodology, the component of vector $x_t = (x_{1t}, x_{2t} \ldots x_{nt})$ are said to be cointegrated of order d, b, denoted by $x_t \sim CI(d, b)$ if:

1. All the components of x_t are integrated of order d.
2. There exists a vector $\beta = (\beta_1, \beta_{2\ldots} \beta_n)$ such that linear combination $\beta x_t = \beta_1 x_{1t} + \beta x_{2t} + \ldots\ldots + \beta_n x_{nt}$ is integrated of order (d-b), where b>0. The vector β is called cointegrating vector.

The detailed procedure of Engel Granger's two step procedure is as follows:

Consider two variables; say capital flows denoted by S_t and economic growth denoted by E_t, which are integrated of order 1; then the Engel and Granger procedure to check for cointegration involves the following two step.

Step 1: In order to estimate the long run equilibrium relationship between capital flows (S_t) and economic growth (E_t), it is only necessary to estimate the static model:

$$S_t = \beta_0 + \beta_1 E_t + e_t \qquad (3.23)$$

Estimating Equation 3.23 using OLS achieves a consistent estimate of the long run steady state relationship between the variables in model, and, all dynamic can be ignored

asymptocally. This arises because of what is termed as the super consistency property of OLS estimators when series are cointegrated.

Step 2: In order to determine if the variables are actually cointegrated, the estimated residuals are generated from Equation 3.23. If these deviations are found to be stationary, then S_t and E_t sequences are cointegrated of order (1, 1). It would be convenient if we could perform DF test on these residuals to determine their order of integration. Let us consider the following regression:

$$\Delta e_t = \alpha_1 e_{t-1} + \varepsilon_t \qquad (3.24)$$

Since the $\{e_t\}$ sequence is residuals from a OLS regression, there is no need to be include an intercept term; the associated t statistic of 'a_1' coefficient can be used to check for stationarity of residuals. However, it may be noted here that when there are two variables tested for cointegration, the usual DF table can be used, but when there involves more than two variables the appropriate critical values are provided by Engel and Yoo (1987). If we cannot reject the null hypothesis of non-stationarity (H_0: $a_1 = 0$), we can conclude that the residual series contains a unit root. Thus, given that both S_t and E_t were found to be I(1) and that the residuals sequence is stationary, we can conclude that the series are co-integrated of order (1, 1).

Now, if we variables are cointegrated, the residuals from equilibrium regression can be used to estimate error correction model (ECM). When S_t and E_t are cointegrated of order (1, 1) the error correction is represented as:

$$\Delta S_t = \alpha_1 + \alpha_s \hat{e}_{t-1} + \sum_{i=1}^{m} \alpha_{11}(i)\, \Delta S_{t-1} \sum_{i=1}^{m} \alpha_{12}(i)\, \Delta E_{t-i} + \varepsilon_{St} \qquad (3.25).$$

$$\Delta E_t = \alpha_2 + \alpha_E \hat{e}_{t-1} + \sum_{i=1}^{m} \alpha_{21}(i)\, \Delta S_{t-1} \sum_{i=1}^{m} \alpha_{22}(i)\, \Delta E_{t-i} + \varepsilon_{Et} \qquad (3.26)$$

Where,

ΔS_t = Change in Private foreign capital flows

ΔE_t = change in economic growth

The ECM involves the estimation of the above equation system and the speed of adjustment is given by the coefficients α_S and α_E which have important implications for the dynamics of the system. Thus, for any given value of e_{t-1}, a large value of α_E is associated with the large values of ΔE_t. On the other hand, α_E is zero, the change in E_t does not at all respond to the deviation from long run equilibrium in period t-1. Thus, α_S and α_E quantify the extent to which the short run deviation from long run equilibrium is adjusted in the next period.

Consider a VAR system of order p where y represents a vector of variables with $k = n$,

$$y\ t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_k y_{t-k} + u_t \quad (3.27)$$

Where y_t is a vector of non-stationary I(1) variables and the A_i 's are $(n \times n)$ coefficient matrices and $u_t = (u_{1t}, u_{2t}, \ldots, u_{n\,t})$ is an unobservable i.i.d. zero mean error term or innovations. It can be re-parameterized by adding and subtracting $A_k y_{t-k+1}$ from the right hand side:

$$\Delta y_t = -\Pi y_{t-1} + \sum_{i=1}^{n-1} \varphi_i \Delta Y_{t-1} + u_t \quad (3.28)$$

Where,

$$\Pi = (I - \sum_{i=1}^{n} A_i) \text{ and } \Phi_i = -\left(\sum_{j=i+1}^{n} A_j\right) = -A^*(L) \quad (3.29)$$

Using exogenous dummy or exogenous variables D, $\Delta y\ t$can be expressed with the following form:

$$\Delta y_t = \Pi y_{t-1} + \Gamma 1 \Delta y_{t-1} + \Phi D_t + u_t \quad (3.30)$$

If the characteristic polynomial in Δy_t

$\Pi(\lambda) = I_p - \lambda\Pi_1 - \lambda^2\Pi_2 = (1-\lambda)I_p - \Pi\lambda - \Gamma_1\lambda(1-\lambda)$ (or the companion matrix) has unit root, then $|\Pi(\lambda)| = 0$ fpr$\lambda = 1$ and $\Pi(1) = -\Pi = -\alpha\ \beta$. And the ECM model becomes:

$$\Delta y_t = \alpha\ \beta y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Phi D_t + u_t \quad (3.31)$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r<k$, then there exist a k x r matrices α and β each with rank r such that $\Pi = \alpha \beta$ and $\beta' y\ t$is (0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. As explained below, the elements of α are known as the adjustment parameters in the VEC model. Johansen's method is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π.

By the use of VECM model several effects can be examined. The $\beta_{i\,j}$ coefficients show the long run equilibrium relationships between levels of variables. The $\alpha_{i\,j}$coefficients show the amount of changes in the variables that bring the system back to equilibrium. $\Gamma_{i\,j}$ coefficients show the short run changes occurring due to previous changes in the variables and $\Phi_{i\,j}$coefficients show the effect on the dynamics of external events.

3.3.6 Vector Auto-regression (VAR)

To examine the dynamic relationship between private foreign capital inflows with macroeconomic variable, a vector auto regression model (VAR) is employed. This approach has two major advantages over the extent of empirical research on this issue. First, VAR superficially resembles simultaneous equation modeling in that all the variables are considered to be endogenous. However, each endogenous variable is explained by its lagged or past values and lagged values of the other endogenous variables included in the model. Usually there are no exogenous variable in the model. Thus, by avoiding the imposition of a priori restriction on the model the VAR adds significantly to the flexibility of the model. Second, the VAR methodology can accommodate general dynamic relationship among economic variables. Because most of the relevant empirical analyses utilize a partial equilibrium framework and do not account fully for dynamic interrelations, previous studies relating this topic may yield misleading inferences.

A natural starting place for multivariate models is treating each variable symmetrically. In a two variable case we can let the time path of private foreign capital inflows $\{P_t\}$ and macroeconomic variables $\{E_t\}$ sequence and let the time path of macroeconomic variables $\{E_t\}$ sequence be affected by current and past realizations of the private capital flows $\{P_t\}$. Consider the simple bi-variate system

$$P_t = b_{10} - b_{12} E_t + \gamma_{11} P_{t-1} + \gamma_{12} E_{t-1} + \varepsilon_{Pt} \quad (3.32)$$

$$E_t = b_{20} - b_{21} P_t + \gamma_{21} P_{t-1} + \gamma_{22} E_{t-1} + \varepsilon_{Et} \quad (3.33)$$

Where, it is assumed that

(i) private foreign capital inflows $\{P_t\}$ and macroeconomic variables $\{E_t\}$,

(ii) both $\{P_t\}$ and $\{E_t\}$ are stationary,

(iii) ε_{Pt} and ε_{Et} are white-noise disturbances with standard deviations of σ_P and σ_E respectively, and

(iv) $\{\varepsilon_{Pt}\}$ and $\{\varepsilon_{Et}\}$ are uncorrelated white-noise disturbances.

The structure of the system incorporates feedback, since P_t and E_t are allowed to affect each other. For example, $-b_{12}$ is the contemporaneous effect of a unit change of E_t on P_t and γ_{12} is the effect of a unit change in E_{t-1} on P_t. The terms ε_{Pt} and ε_{Et} are pure innovations (or shocks) in P_t and E_t respectively. If b_{21} is not equal to zero, ε_{Pt} has an indirect contemporaneous effect on E_t and if b_{12} is not equal to zero, ε_{Et} has an indirect contemporaneous effect on P_t.

The Equations *3.32* and *3.33* are not reduced form equations since E_t has a contemporaneous effect on P_t and P_t has a contemporaneous effect on E_t. Using the matrix algebra, the system of equations can be transformed into a more usable and compact form. Rewriting the system of equations in matrix form we get:

$$Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \varepsilon_t \quad (3.34)$$

Where,

$$B=\begin{bmatrix}1 & -b_{12}\\ -b_{21} & 1\end{bmatrix};\quad x_t=\begin{bmatrix}P_t\\ E_t\end{bmatrix};\quad \Gamma_0=\begin{bmatrix}b_{10}\\ b_{20}\end{bmatrix};\quad \Gamma_1=\begin{bmatrix}\gamma_{11} & \gamma_{12}\\ \gamma_{21} & \gamma_{22}\end{bmatrix} \text{ and } \quad \varepsilon_t=\begin{bmatrix}\varepsilon_{Pt}\\ \varepsilon_{Et}\end{bmatrix}$$

Equation *3.34* represents primitive form of VAR. Pre-multiplication by B^{-1} in Equation *3.34* gives us the Vector Autoregressive (VAR) model in standard form:

$$x_t = A_0 + A_1 x_{t-1} + e_t \tag{3.35}$$

Where, $A_0 = B^{-1}\Gamma_0$; $A_1 = B^{-1}\Gamma_1$, and $e_t = B^{-1}\varepsilon_t$. The process in Equation 3.35 looks like an autoregressive process but with a difference that x_t, A_0 and e_t are now vectors. For notational purposes, we can define a_{i0} as element *i*of the vector A_0; a_{ij} as the element in row *I* and column *j* of the matrix A_1; and e_{it} as the element *i* of the vector e_t. Using this notation, the Equation *5.15* can be rewritten in the equivalent form:

$$P_t = a_{10} + a_{11}P_{t-1} + a_{12}E_{t-1} + e_{1t} \tag{3.36}$$

$$E_t = a_{20} + a_{21}P_{t-1} + a_{22}E_{t-1} + e_{2t} \tag{3.37}$$

It is important to note that the error terms (i.e. e_{1t} and e_{2t}) are composites of the two shocks ε_{Pt} and ε_{Et}.. Since $e_t = B^{-1}\varepsilon_t$, e_{1t} and e_{2t}can be computed as:

$$e_{1t} = (\varepsilon_{Pt} - b_{12}\varepsilon_{Et})/(1 - b_{12}b_{21}) \tag{3.38}$$

$$e_{2t} = (\varepsilon_{Et} - b_{21}\varepsilon_{Pt})/(1 - b_{12}b_{21}) \tag{3.39}$$

Since ε_{Pt} and ε_{Et} are white noise processes, it follows that both e_{1t} and e_{2t} have zero means, constant variances and are individually serially uncorrelated. But the critical point to be noted is that the covariance between $e_{1t}$and e_{2t}will not be zero so that two shocks will be correlated. In the special case, where $b_{12} = b_{21} = 0$ (i.e. if there are no contemporaneous effects of P_t on E_t and E_t on P_t), the shocks will be uncorrelated. It is useful to determine the

variance and covariance matrix of the $e_{1t}$and e_{2t}shocks as:

$$\sum = \begin{bmatrix} \text{var}(e_{1t}) & \text{cov}(e_{1t}, e_{2t}) \\ \text{cov}(e_{1t}, e_{2t}) & \text{var}(e_{2t}) \end{bmatrix} \tag{3.40}$$

Since all elements of $\sum$ are times independent, we can use the more compact form:

$$\sum = \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix} \tag{3.41}$$

Where, $var(e_{it}) = \sigma_i^2$ *and* $\sigma_{12} = \sigma_{21} = cov(e_{1t}, e_{2t})$.

Now we may discuss the different steps that are associated with computation of VAR model

3.3.6.1 Choice of Lag Length

In order to check lag length at first, the longest plausible length or longest feasible length is chosen given degrees of freedom consideration. For example, using quarterly data, lag length 12 is chosen. Second the VAR is estimated and variance and covariance matrixes of residuals are formed. Variance and covariance matrixes of residuals from 12-lag model can be called Σ_{12}. Now suppose, we want determine if 8 lag is appropriate. The restriction of model from 12 to 8 lags would reduce the number of estimated parameters by 4n in each equation.

3.3.6.2 Selection of Variables in the System

Now, we discuss some of the important steps, which are involved in VAR estimation. To begin with, the selection of appropriate variable to be included in the model is very important. There is no specific method for selection of the variable. The choice is purely based on the underlying economic theory. Testing the stationarity of the variables is the next step. In time series literature, unit root tests are used to check whether a variable or series

included in the model is stationary or not. For the VAR estimation, it is essential that all the variables included in the system should be stationary either at level or at first differences.

The last and vital step of VAR estimation is the selection of appropriate lag length of each variable in the system. The selection of the appropriate lag length is the biggest practical challenge in VAR modeling. It may be possible to use different lag length for each variable in the equation. Such type of VAR is called as NEAR VAR and can be estimated through seemingly unrelated regression (SUR). But for the sake of simplicity the same lag length is used for all equations. Various lag selection criteria are used to select the optimum lag length of the model. These are likelihood ratio (LR), final prediction error (FPE), Akaike information criteria (AIC), Schwarz information criteria (SIC) and Hannan–Quinn information criteria (HQ). Having set the lag length, the final step is to estimate the model.

The model is estimated through ordinary least squires (OLS). The most important thing is that the individual coefficients in estimated VAR models are often difficult to interpret directly. To overcome this problem, we use innovation accounting techniques, which include impulse response function and variance decomposition.

The variables to be included in the VAR are selected according to the relevant economic model. Otherwise no explicit attempt is made to 'pare down' the number of parameters estimates. Suppose a multivariate VAR is given as follows:

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} + \ldots\ldots\ldots . + A_p X_{t-p} + e_t \qquad (3.42)$$

Where, X_t = the (n × 1) vector containing each of the n variables included in the VAR

A_0 = an (n×1) vector of intercept terms.

A_i = an (n×n) matrix of coefficient.

e_t= an (n×1) vector of error terms.

In the above example, matrix A_0 contains n intercept term and each matrix A_i contains n^2 coefficients, hence $n+pn^2$ terms need to be estimated. Unquestionably, a VAR will be over parameterized by which many of these coefficient estimates can be properly exclude.

3.3.6.3 Exogenity in VAR Model

A necessary condition for the exogenity of St is that current and past values of E_t do not affect S_t. The sequence {St} may not exogenous to $\{E_t\}$ even though $\{E_t\}$ does not Granger cause {St}. Because pure shocks to $\{E_t\}$, i.e. ε_{Et}, may affect the value of {St}, though $\{E_t\}$ sequence does not Granger cause the {St} sequence.

A block exogenity test is useful to determining whether to incorporate a variable into a VAR. Given the above distinction between causality and exogenity, the multivariate generalization of the Granger-Causality test should be called a 'block causality' test. In any event, the issue is to determine whether the lags of one variable, say W_t Granger cause any of the variables in the system. In the three variables case, W_t, Stand E_t, the test is whether lags of W_t in the Stand E_t, equations to be equal to zero. This cross equation restriction is properly tested using the likely hood ratio test given as follows:

$$(T-c)\ (\log|\Sigma_r|-\log|\Sigma_u|) \qquad (3.43)$$

Where, Σ_u and Σ_r are the variance and covariance matrixes of the unrestricted and restricted respectively.

3.3.6.4 Impulse Response Function (IRF)

The impulse response function (IRF) shows the dynamic responses of all variables in the system to a shock or innovation in each variable. For computing IRFs, it is essential that the variables in the system are ordered and that the system is represented by a moving average process. The vector moving average (VMA) representation of Equation *3.44* expresses the

variables P_t and E_t in terms of current and past values of the two shocks ε_{Pt} and ε_{Et}.

Writing Equations *3.42* and *3.43 in* matrix form, we get:

$$\begin{bmatrix} P_t \\ E_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} + \begin{bmatrix} P_{t-1} \\ E_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \tag{3.44}$$

Now, recalling the VAR model in standard form, i.e. Equation *3.42*, we have:

$x_t = A_0 + A_1 x_{t-1} + e_t$

If we iterate back-wards and assume that stability condition is met, then the particular solution for $x_t$is:

$$x_t = \mu + \sum_{i=o}^{\infty} \phi_1^i e_{t-i} \tag{3.45}$$

Where $\mu = [\bar{P}, \bar{E}]$

Using Equation *3.45* we can rewrite Equation *3.44* as:

$$\begin{bmatrix} P_t \\ E_t \end{bmatrix} = \begin{bmatrix} \bar{P} \\ \bar{E} \end{bmatrix} + \sum_{I=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} e_{1t-i} \\ e_{2t-i} \end{bmatrix} \tag{3.46}$$

Equation 3.42 expresses $P_t$and E_t in terms of the $\{e_{1t}\}$ and $\{e_{2t}\}$ sequences. However, it is possible to rewrite Equation *3.42 in* terms of $\{\varepsilon_{Pt}\}$ and $\{\varepsilon_{Et}\}$ sequences. From equation *3.38* and *3.39*, the vector of error terms can be written as:

$$\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = (1/1-b_{12}b_{21}) \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{Pt} \\ \varepsilon_{Et} \end{bmatrix} \tag{3.47}$$

Now, Equations *3.42* and *3.43* can be combined to form:

$$\begin{bmatrix} P_t \\ E_t \end{bmatrix} = \begin{bmatrix} \bar{P} \\ \bar{E} \end{bmatrix} + (1/1-b_{12}b_{21}) \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{St} \\ \varepsilon_{Et} \end{bmatrix} \tag{3.48}$$

To simplify the above notation, now define the 2 x 2 matrix ϕ_i with elements ϕ_{jk} (i) such that:

$$\phi_i = [A_1^i/(1-b_{12}b_{21})] \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \tag{3.49}$$

Hence, the moving average representation of Equations *3.43* and *3.44* can be written in terms of $\{\varepsilon_{Pt}\}$ and $\{\varepsilon_{Et}\}$ sequences:

$$\begin{bmatrix} P_t \\ E_t \end{bmatrix} = \begin{bmatrix} \bar{P} \\ \bar{E} \end{bmatrix} + \sum_{i=o}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} \varepsilon_{St-i} \\ \varepsilon_{Et-i} \end{bmatrix} \tag{3.50}$$

Or, more compactly:

$$x_t = \mu + \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i} \tag{3.51}$$

The moving average representation is especially useful to examine the interaction between $\{P_t\}$ and $\{E_t\}$ sequences. The coefficients of ϕ_i can be used to generate the effects of ε_{Pt} and ε_{Et} shocks on the entire time paths of the $\{P_t\}$ and $\{E_t\}$ sequences. The four elements ϕ_{jk} *(0)* are called as impact multipliers. For example, coefficient ϕ_{12} *(0)* is the instantaneous impact of a one unit change in ε_{Et} on P_t. Similarly, the elements ϕ_{11} *(1)* and ϕ_{12} *(1)* are the one-period response of unit changes in ε_{Pt-1} and ε_{Et-1} on P_t respectively.

The four sets of coefficients $\phi_{11}(i), \phi_{12}(i)$, $\phi_{21}(i)$ and $\phi_{22}(i)$ are called impulse response functions. Plotting the impulse response functions [i.e. plotting the coefficients of $\phi_{jk}(i)$ against i] is a practical way to visually represent the behavior of the $\{P_t\}$ and $\{E_t\}$ series in response to the various shocks. With knowledge of knowing all the parameters of the primitive system of Equations, it is possible to trace out the time paths of the effects of pure ε_{Pt} or ε_{Et} shocks. However, this methodology is not applicable if the estimated VAR is under or over identified. Here, in this example, the estimated VAR is under-identified, because primitive VAR system contains 10 parameters whereas VAR in standard form contains only 9 parameters. So, an additional restriction on the VAR system must be imposed in order to identify the impulse responses. One possible identification restriction is to use the *Choleski decomposition*. For example, it is possible to contain the system such that the contemporaneous value of P_t does not have a contemporaneous effect on E_t. Finally, this restriction is represented by setting $b_{21} = 0$ in the primitive system. In terms of Equation the error terms can be decomposed as follows:

$$e_{1t} = \varepsilon p_t + b_{12}\varepsilon_{ET} \tag{3.52}$$

$$e_{2t} = \varepsilon_{Et} \tag{3.53}$$

Equation *3.47* shows all the observed errors from the $\{e_{2t}\}$ sequence are attributed to ε_{Et} shocks. Given the calculated $\{\varepsilon_{Et}\}$ sequence, knowledge of the values of the $\{e_{1t}\}$ sequence and the correlation coefficient between $e_{1t}$and e_{2t} allows for the calculation of the $\{\varepsilon_{Pt}\}$ sequences using equation *3.46*. Although this decomposition contains the system such that a ε_{Pt} shock has no direct effect on E_t, there is an indirect effect in that lagged values of P_t affect the contemporaneous value of E_t. The key point is that the decomposition forces potentially important asymmetry on the system, because ε_{Et} has contemporaneous effects on both P_t and E_t. For this reason, Equations *3.52* and *3.53* imply an ordering of variables. An ε_E shock directly affects $e_{1t}$and e_{2t}, but an ε_{Pt} shock does not affect e_{2t}. Hence, $E_t$is 'prior' to P_t. Alternatively, by putting $b_{12} = 0$, the errors can be decomposed as:

$$e_{1t} = \varepsilon p_t \tag{3.54}$$

$$e_{2t} = b_{21}\varepsilon_{pt} + \varepsilon_{Et} \tag{3.55}$$

It is crucial to note that the importance of the ordering depends on the magnitude of the correlation coefficient between $e_{1t}$and e_{2t}. For example, if the correlation coefficient is equal to zero, the ordering is immaterial. Finally, Equations *3.54* and *3.55* can be replaced with $e_{1t} = \varepsilon_{Pt}$ and $e_{2t} = \varepsilon_{Et}$. On the other hand, if the correlation coefficient is unity (so that two shocks are equivalent), it is inappropriate to attribute the shock to a single source.

3.3.6.5 Variance Decomposition

Variance decomposition is used to detect the causal relation among the variables. It explains the extent to which a variable is explained by the shocks in all the variables in the system. The forecast error variance decomposition explains the proportion of the movement's private foreign capital inflows in a sequence due to its own shock versus shocks to the other macroeconomic variable. The VAR in standard form, i.e. Equation *3.56* is written as follows:

$$x_t = A_0 + A_1 x_{t-1} + e_t \tag{3.56}$$

Now, suppose the coefficient $A_0$and A_1 is known and we want to forecast the various values of x_{t+1} conditional to the observed value of x_t. Updating the above equation by one period (i.e. $x_{t+1} = A_0 + A_1 x_t + e_{t+1}$), the conditional expectation of x_{t+1} is:

$$E_t x_{t+1} = A_0 + A_1 x_t \tag{3.57}$$

Here, one-step ahead forecast error is $x_{t+1} - E_t x_{t+1} = e_{t+1}$. Similarly, the two-step ahead forecast error of x_{t+2} is:

$$E_t x_{t+2} = [1 + A_1]\, A_0 + A_1^2 x_t \tag{3.58}$$

The two-step ahead forecast error is $e_{t+2} + A_1 e_{t+1}$. More generally the n-step ahead forecast is:

$$E_t x_{t+n} = [1 + A_1 + A_1^2 + \ldots\ldots\ldots + A_1^{n-1}]A_0 + A_1^n x_t \quad (3.59)$$

And, the associated forecast error is:

$$E_{t+n} + A_1 e_{t+n-1} + A_1^2 e_{t+n-2} + \ldots\ldots\ldots\ldots + A_1^{n-1} e_{t+1} \quad (3.60)$$

It is possible to write the forecast errors in terms of the ε_{Pt} and ε_{Et} shocks. The forecast error variance decomposition tells the proportion of their movements in a sequence due to its own shock versus shocks to the other variable. If ε_{yt} shocks explain none of the forecast error variances of ε_{Pt} at all forecast horizons, it can be said that $\{P_t\}$ sequence is exogenous. In such a circumstance, the $\{P_t\}$ sequence would evolve independently of the ε_{Et} shocks and of $\{E_t\}$ sequence. On the other hand, if ε_{Et} shocks explain all of the forecast error variances in $\{P_t\}$ sequence at all forecast horizons, then $\{P_t\}$ would be entirely endogenous.

3.3.7 Generalized ARCH (GARCH) Models

In order to examine the effect of volatility of U.S fed rate and international capital flows on the domestic financial market efficiency in India we have used ARCH and GARCH methods.

The above discussed ARCH model may call for long lag structure to model the underlying volatility in the market. Keeping this view in mind, a more parsimonious and broad class of model was developed by Bollerslev (1986) and Taylor (1986). The simplest form of GARCH model is the GARCH (1, 1) model which is written as

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

Or

$$h_t = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \ldots\ldots\ldots \quad (3.61)$$

Where, $\alpha_0 > 0$; $\alpha_1 \geq 0$; $\beta_1 \geq 0$

The stationary condition for GARCH (1,1) is $\alpha_1 + \beta_1 < 1$.

GARCH model says that the conditional variance of u at time t depends not only on the squared error terms in the previous time period [i.e. ARCH (1)] but also the conditional variance in the previous time period. The GARCH model essentially generalizes the purely autoregressive moving average model. The weight on pass squared residuals is assumed to decline geometrically at a rate to be estimated from the data.

The conditional volatility equation represented by (3.61) comprises of three terms, viz., (a) the mean, α (b) news about volatility from the previous period, measured as the lag of the squared residual from the mean equation, $u^2_{t-1,} \alpha$ and (c) the last periods forecast error variance $\delta^2_{t-1,} \beta$. The GARCH specification suggests that an agent predicts this period's variance by forming a weighted average of a long term average (the constant), the forecast variance from the last period and information about the volatility observed in the previous period. In the GARCH (1, 1) model, the effect of a return shock on current volatility declines geometrically over time. This model gives weights to the conditional variance (δ_t^2), the previous error variance (δ_{t-1}^2) and the news about volatility of the previous period (u^2_{t-1}).

The GARCH specification allows us to model the variance of exchange rate changes as time dependent. This is in contrast with the usual assumption made when estimating a moving average process in which it is assumed that the error term has a constant variance. Overall, this specification permits us to exploit pattern and persistence in the behavior of volatility. The time dependent specification has the additional property that it explains the

heavy tailed nature of the distribution of the exchange rate changes. By modeling volatility explicitly, GARCH model directly relates risk in the foreign exchange market to trade performance. Another advantage of the GARCH approach lies in producing more efficient estimates since heteroskedasticity of the error is handled properly.

3.3.7.1 GARCH (p,q) Model

The GARCH model can be extended to a GARCH (p,q) model in which p is the lagged term of the squared error term and q is lagged conditional variance. This may be represented as;

$$h_t = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 u_{t-2}^2 + ... + \alpha_q u_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \beta_2 \sigma_{t-2}^2 + ... + \beta_p \sigma_{t-p}^2 \quad (3.62)$$

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i u_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 \quad (3.63)$$

Where, $\alpha > 0, \alpha_i \geq 0, \beta_j \geq 0$

In both ARCH and GARCH models, restrictions are to be placed on the parameters to keep the conditional volatility positive. This also implies that any shock is always an indication of increase in conditional volatility forever. In order to check the presence of ARCH effects on the data, we have applied Lagrange Multiplier (LM) tests.

GARCH is a not suitable for analysis of volatility spillover effects due to its univariate nature, one of the additions of GARCH (*p,q*) type models named MGARCH is dominantly applied by previous studies for multidirectional volatility spillover effects analysis across markets. Example, these studies discussed earlier in the literature section are Maghyereh and Awartani (2012), Lee (2010) and Maghyereh, Al-zoubi (2004). In a multivariate case, in order to demonstrate a MGARCH model based on a simple case of two variables, two error processes are written as

$$u_{1t} = v_{1t}\sqrt{h_{11t}};\ u_{2t} = v_{2t}\sqrt{h_{22t}} \quad (3.64)$$

Where v_{it}, is a white noise process and h_{11t} *and* h_{22t} are conditional variances of u_{1t} and u_{2t} and h_{12t} is considered as the conditional covariance between the two shocks.

Whereas, $h_{12t} = E_{t-1}u_{1t}u_{2t}$. h_{12} allows for the possibility that the shocks are correlated. In the mentioned case, $H_t$can be expressed as,

$$H_t = \begin{bmatrix} h_{11t} & h_{12t} \\ h_{12t} & h_{22t} \end{bmatrix} \quad (3.65)$$

In order to specify functional forms of h_{ijt}, one familiar specification is through *vech* notation.

Where, the *vech* operator transforms the upper (lower) triangle of a symmetric matrix into a column vector. In this case, *Ht* can be written as

$Vech\ (H_t) = [h_{11t}\ ,\ h_{11t,}\ h_{11t}]'$ and $u_t = [u_{1t,}\ u_{2t}]'$ (3.66)

By using *vech* notation, MGARCH (1,1) model is specified as:

$$vech\ (H_t) = C + Avech\ (u_{t-1}u'_{t-1}) + Bvech\ (H_{t-1}) \quad (3.67)$$

Here*C* is a vector of intercepts, *A* and *B* are 3×3 matrices, $vech\ (u_{t-1}u'_{t-1})$is moving average and $vech\ (H_{t-1})$is autoregressive parts of the model respectively.

A modified GARCH-M is applied in this analysis and modeled to allow for volatility spillover effects. A modified GARCH-M model can be written as

$$h_t = \varphi_0 + \varphi_1 h_{t-1} + \varphi_2 u^2_{t-1} + \varphi_3 \hat{u}^2_{a,t-1} \quad (3.68)$$

Where r_t is the monthly return, h_t is conditional variance, u_t is the residual with standard properties with mean zero and variance h_t,

$$u_{it} = v_{it}\sqrt{h_{iit}}, v_{it} \square N\ (0,1); \quad (3.69)$$

u^2_{t-1}, is lagged squared residuals of the country under investigation.

Application of a unidirectional model is to analyze the important receiving effects by

Indian financial markets, coming from the U.S. financial market. This unidirectional analysis is applied through a two-stage procedure based on a modified GARCH-M. A modified GARCH-M is used in this research, since our pre-empirical analysis on the applied data indicates existence of risk effects in the mean equation, in several cases. These significant effects shed light on necessity of allowing risk in the mean equation, application of GARCH-M.

As mentioned volatility spillover effects analysis is done through two-stage estimation, meaning that measure of volatility is derived for the country in the first step; and then model for India is re-estimated with U.S fed rate volatilities in the second step, analyzing the effects of volatility spillover effects fed rate on volatility through capital flows of Indian financial market efficiency. In order to analyze unidirectional volatility spillover effects between markets, modified version of GARCH-M is mostly applied by previous studies. Some papers applied this model for their analysis are Abou-Zaid (2011), Moon and Yu (2010), Le and Kakinaka (2010), Yasushi *et al.* (1990). A modified GARCH-M modeled to analyze the volatility spillover effects could be written as,

$$h_t = \varphi_0 + \varphi_1 h_{t-1} + \varphi_2 u_{t-1}^2 + \varphi_3 \hat{u}_{a,t-1}^2 \quad (3.70)$$

$$h_t = \varphi_0 + \varphi_1 h_{t-1} + \varphi_2 u_{t-1}^2 + \varphi_3 \hat{h}_{a,t-1}^2 \quad (3.71)$$

a= India

Where $\hat{u}_{a,t-1}^2$ are the lagged squared residuals, and $\hat{h}_{a,t-1}^2$ are conditional variances of the selected fed rate plugged in the volatility equation, in turn. Indicating that φ_3 in equations (3.70) and (3.71) is capturing the volatility spillover effects from the U.S. fed rate to BSE efficiency, estimated separately.

Since information on bilateral portfolio flows amongst countries is not openly available at a high frequency, we limit our analysis to U.S. transactions in foreign stocks. We have collected the monthly data on cross-border equity portfolio flows to India from U.S

(expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. This study covers the monthly data from January 2003 until July 2015. Variables are Cross border capital flows, U.S. Fed rate, market index return and macroeconomic variables such as interest rate, exchange rate and inflation. We have also collected monthly data from Reserve Bank of India (RBI), World Federation of Exchange (WFE) and Federal Reserve Bank of ST. Louis.

Chapter 4

International Capital Flows and Financial Market Dynamics: Empirical Analysis

4.1 Introduction

In the preceding chapter we portray the tools and techniques of time series analysis, where various econometric models used have been discussed. This chapter empirically analyses International capital flows and Indian financial market dynamics (including both liquidity, efficiency and macro-economic). Macroeconomic variable includes, such as exchange rate, money, foreign exchange reserve and interest rates, inflation rate and monetary policy impact in India. Some of the previous studies suggest that capital inflows play a vital role in exchange rate appreciation, monetary expansion, rise in foreign exchange reserve and economic growth. International capital flows contribute directly to economic growth. The capital flows, both foreign direct investments and portfolio inflows into developing countries during 1980's was deemed to be influenced by the internal as well as external factors related to the domestic economies. It was also argued that the volatility of both types of capital flows are almost the same and the contention that the portfolio flows are: the inflows reduce the cost of capital and assist in the development of domestic capital market, enhance the mobilization of domestic resources, diversify the sources of external finance and increase the risk bearing capacity of the investors. In India, the emerging markets were not fully integrated up to the early 1980's.

The following chapters are divided into four sections.

Section-1 describes the dynamic relationship between effect of international capital flows on financial market liquidity and return in selected G20 countries. The analysis is carried out with help of time series techniques such as FMOLS/DOLS, PMG/ARDL and

cross country analysis.

Section-2 examines the spill-over effect of fed policy on Indian financial market efficiency and international capital flows using regression analysis and generates GARCH (p,q) process and VECM methodology.

Section-3 discusses the puzzles of Indian financial market includes both pull and Push approach impact of private foreign capital inflows on Indian economy using vector auto-regression (VAR) and impulse response function (IRF) and variance decomposition technique .

Finally, section-4 empirically examines the impact of international capital flows on Indian financial market and economic growth using vector error correction model (VECM) and impulse response function.

Section - I

4.2 Effect of Foreign Capital Flows on Financial Market Liquidity and Returns in Selected G20 Countries

4.2.1 Introduction

Financial market liquidity is a fundamental concept of finance. The majority of equilibrium asset pricing models does not cogitate trading and therefore ignores the time and price transformation and vice versa. The lesion from recent global financial crisis in 2008 suggested that market conditions can be severe and liquidity can be declined or even meltdown in any moment. Such liquidity shocks are a potential channel through which asset prices are influenced by liquidity. Recent studies provide mixed evidence on the impact of capital flows on local financial market liquidity. Radelet and Sachs (1998), Kim and Wei (2002), Kaminsky, Lyons, and Schmukler (2004) have found, foreign investors are often alleged to exacerbate financial crises on local markets. However, several prior studies found that, an increase in foreign portfolio flows is associated with decrease in local systematic

risk and a reduction in the local cost of equity capital (Chari and Henry, 2004, Bekaert, Harvey, and Lumsdaine, (1999, 2002), Kim and Singal (2000).Moreover, the movements of foreign investors did not contribute to destabilizing the Korean stock market throughout the Asian financial crisis (Choe, Kho, and Stulz, 1999). Pastor and Stambaugh (2001) found that, the expected stock returns are cross-sectionally related to liquidity risk. They have questioned, how do foreign investors move local capital markets? This question has been the subject of penetrating debate in both academic and policy makers.

There are various different channels through which foreign investors could affect directly or indirectly domestic financial market liquidity and return. Prior studies have emphasized the asymmetric information and home bias behavior of market microstructure is a significant determinant of both liquidity and stock return. In regards to existing literature on asymmetric information, we found results are mixed. Brennan and Cao (1997), Seasholes (2000), Ramadori (2001), Froot, O'connell, and Seasholes (2001), Choe, Kho, and Stulz (2001), and Bhattacharya, Daouk, Jorgenson, and Kehr (2000) have pointed out that foreign investors may be sophisticated and fail to gather private information at the time of local trading. Very few researches have concentrated on the noise trading activities of foreign investors. If foreign investors are less informed, that can have some impact on market liquidity. In other words, the noise traders can improve the market liquidity by which they tend domestic market return as well. De Long, Shleifer, Summers, and Waldmann (1990), and Kang and Stulz (1997), Choe, Kho, and Stulz (2005) have found that, domestic investors have an home bias informal advantage in countries like Japan, Korea, and Indonesia respectively. Moreover, to yield more return the sophisticated investors tries to enhance the foreign market liquidity. Therefore, investors can channelize some liquidity and gain some return out of the bad situation. Hendershott*et al.*, (2010) found that, algorithmic trading is general strategy by sophisticated investors, enhances liquidity on the New York Stock Exchange (NYSE). The prior studies find out the evidence of the herd behavior of foreign investors. As it is known that the trading behavior of foreign investors can diminish the domestic market liquidity with the increasing rate of volatility. Choe*et al.*, (1999) found

that, the evidence of herd behavior of foreign investors on domestic market works for short-time period. Blum *et al.,* (1989) found, S&P stocks declined at the time "Black Monday" due to heavy selling pressure as compared to non-S&P stocks. In case of India, investors face similar situation numerous times for a short time span. Whereas, Boyer *et al.*, (2006) found the presence of foreign investors in domestic market adds to the international spreading of stock market crisis consequences of domestic market liquidity. In this chapter, we investigate the impact of foreign capital flows on domestic market from three different perspectives. Our study mainly focuses the interaction between foreign capital flows with domestic markets liquidity and profitability. The profitability implies the expected rate of return by the investors; it may be foreign or domestic investors. This study mainly addresses three research questions such as:

(1) Whether foreign capital flows channelize or dry-out domestic financial market?
(2) Do foreign capital flows react during the time of financial crises?
(3) Is there any contagious interaction exists between liquidity and foreign capital flows across market?

In this section we briefly discuss the empirical results. The result shows that both liquidity and market return positively affect capital flows. Market liquidity has direct impact on capital flows while market return doesn't have.

4.2.2. Economic Significance of the Study

According to neoclassical theory, capital flows are driven by return differentials across countries. Like diminishing marginal productivity implies a decreasing marginal rate of return as or with capital accumulates. This is directly indicating that without any restriction the capital will flow where returns are higher, that is where capital is relatively scarce. Foreign capital flows channelization in the domestic market allows the home country or host country for lending or borrowing money to finance more lucrative projects. The above view is perhaps best represented by the renowned Lukas' paradox (Lucas, 1990), represents that

capital flows to the country with higher marginal productivity. It raises the traditional views like "push vs pull" and "sudden stops" debate. However, the prior literature still suffers from a more fundamental and theoretical weakness. The dynamics of capital flows are thus determined by the essential real economic decisions. Our analysis reflects the real scenario of the challenging environment, which compels to investigate the relation within foreign capital flows and domestic market liquidity and returns.

4.2.3 Data and Estimation Approach

Since information on bilateral portfolio flows amongst countries is not openly available at a high frequency, we limit our analysis to U.S. transactions in foreign stocks. We obtain monthly data on cross-border equity portfolio flows (expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. Data from January 2003 until July 2015 has been used for the study. Direct cross-border investment activities are generally not included in the TIC report[6].

Using the major stock exchanges (top 20 by Market Capitalization) of issued share of domestic companies, we categorize the 20 countries in our sample[7]. Our final sample includes 2718 total observations from all 18 stock exchanges, such as, U.S. China, Japan, Germany, France, Brazil, U.K., Italy, Russia, India, Canada, Australia, Spain, Mexico, South Korea, Indonesia, Turkey, Saudi Arabia, Argentina, and South-Africa. Again we divided our data into two sets, first one is developed market and other is developing market and emerging market[8]. Our final sample includes developed markets such as U.S., U.K., Australia, Canada, France, Germany, Japan, South-Korea, and Spain and developing markets such as Argentina, Brazil, China, Indonesia, India, Mexico, Russia, Turkey and South-Africa. We use various sources such as World Federation of Exchanges (WFE),

[6]Tesar and Werner, 1994, 1995.
[7]As of 31st January 2015 monthly report of World Federation of Exchanges (WFE).
[8] As per the Dowjones, MSCI, FTSE, Russell and S&P report 2013 country classification.

yahoo finance, Money control and Quandl to collect the monthly adjusted price (P; closing price in US$ currency, which is adjusted for spilt and dividends), the monthly return index (MR), Trading volume at a monthly frequency (VO; expressed in 1000 shares), the monthly market capitalization (MV; expressed in millions of US$). We have restricted our dataset to major stock exchanges of G20 countries[9]. In case of U.S., we only used NYSE stock market data. For some countries like Japan (Osaka and Tokyo) and China (Shenzen and Shanghai), we have collected data from more than one stock exchange. We have taken 18 countries data out of G20 countries for our analysis. We have considered 18 countries out of 20 countries in G20 because of unavailability of data in our study. The countries we have excluded from our analysis are Russia and Saudi Arabia.

4.2.4 Empirical Motivation

The literature on panel data econometrics with integrated dataset has experienced rapid development since the 1990s. This section focuses on the empirical literature that has considered the panel data co-integration with structural break. Pedroni (1999, 2004) suggests seven statistics to test the null hypothesis of no co-integration using single-equation methods based on the estimation of static regressions. Since the statistics are based on single-equation methods the co-integrating rank for each unit is either 0 or 1, with a heterogeneous co-integrating vector for each unit. After estimating individual static regressions for each unit, the co-integrating residuals are used to compute each of the statistics. The seven statistics are ordered into two different groups depending on whether they are within-dimension-based statistics homogeneity or between-dimension-based statistics where heterogeneous behavior (across the units of the panel) is allowed.

To motivate our proposed work we investigate the effects of structural breaks on the

[9]We refer to the exchanges on which majority of each country's stocks are listed in line with Karolyi, Lee, and Van Dijk (2009).

parametric group of Pedroni statistics through Monte Carlo simulations. First, we focus on the case where there is co-integration but the deterministic component changes at a point in time. Subsequently we also consider the case of an unstable co-integrating vector.

The Data Generating Process (DGP) is given by:

$$y_{i,t} = f_i(t) + x'_{i,t}\delta_{i,t} + e_{i,t} \quad (4.1)$$

$$\Delta x_{i,t} = v_{i,t} \quad (4.2)$$

$$e_{i,t} = \rho_i e_{i,t-1} + \varepsilon_{i,t} \quad (4.3)$$

$$\vartheta_{i,t} = (\varepsilon_{i,t} v_{i,t})' \sim iid\ N\ (0, I_2) \quad (4.4)$$

Where, $f_i(t)$denotes the deterministic component.

y_{it} = be a {mx1} vector of non-stationary stochastic process whose elements are individually I(1).

p_i = Autoregressive parameter, which should be (0 to 0.95)

ΔX_{it} = explains the situation analyses the effects of both the change in the level and the co-integrating vectors.

Finally, when the level, time trend and change in co-integrating vector, and a model is estimated to compute the pseudo t-ratio Pedroni panel data co-integration statistic. This include individual and time effects, the change in the trend implies further reductions on the empirical power of the statistic when the breakpoint is located in the middle and at the end of the period.

4.2.5 Results and Discussion

In this section we briefly discuss the empirical results. The result shows that both liquidity and market return positively affect capital flows. Market liquidity has direct impact on capital flows while market return doesn't have.

4.2.5.1 Panel Unit Root Test

In this study, we have performed the panel unit root tests proposed by Breitung (2000), Im *et.al.*(1997), and Levin, Lin & Chu (2002) and Fisher Chi-square (1932). Under the null hypothesis, there is a unit root, while under the alternative hypothesis, there is no unit root. In this case, Levin *et al.* (2002) requires bias correction factors to correct for cross-sectionally heterogenous variances to allow for efficient pooled OLS estimation, while Breitung (2000) test use appropriate variable transformations to derive the same results. Im *et al*. (1997) has superior in case of t–bar implementation. There are two different methods in constructing the t-bar test statistics; i.e ADF test statistics for individual country and Maddala and Wu, (1999).

Table 4.1

Panel Unit Root Test

Variables		***DFLOW***	***DLIQ***	**DRETURN**
Levin, Lin & Chu	level	-9.43 (0.06)	-1.05 (0.14)	10.49 (1.00)
	1st diff	-18.81***(0.00)	-55.87*** (0.00)	-29.38*** (0.00)
Breitung	level	-3.47 (0.05)	0.13 (0.55)	-6.43 (0.00)
	1st diff	-5.60***(0.00)	-7.95*** (0.00)	-5.14*** (0.00)
Im, Pesaran and Shin	level	-17.32 (0.08)	-2.43 (0.00)	-15.38 (0.07)
	1st diff	-49.79*** (0.00)	-58.43*** (0.00)	-55.13*** (0.00)
ADF - Fisher Chi-square	level	353.05 (0.049)	60.18 (0.07)	291.39 (0.00)
	1st diff	1416.68***(0.00)	1555.54***(0.00)	1542.96*** (0.00)
PP - Fisher Chi-square	level	1080.56 (0.04)	439.76 (0.00)	1285.72 (0.00)
	1st diff	524.73***(0.00)	792.58*** (0.00)	515.55*** (0.00)

Note: ** Probabilities for Fisher tests are computed using an asymptotic Chi square distribution. All other tests assume asymptotic normality. Lag Length are chosen by the Schwarz Info criterion (SIC).probability values are in brackets. *** denotes statistical significance at the 1% level.
Source: Author's Calculation

The above table 4.1 reports the results of unit root tests, which indicate that all the variables in our study are stationary at first difference with individual intercept and trend. Panel unit root tests confirm that both liquidity and returns series are integrated order I(1).

4.2.5.2 Panel Co-integration test

Once the existence of a panel unit root has been established, whereas, the issue arises whether there is any existence of long-run equilibrium relationship among the variables. However, each variables are integrated of order one I(1). Henceforth, we use the panel co-integration tests by Pedroni's (1999). Pedroni (1999) has proposed seven tests that could be used to test for panel co-integration in the absence of structural breaks such as Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic (non-parametric), Panel ADF-Statistic (parametric), Group rho-Statistic, Group PP-Statistic (non-parametric), Group ADF-Statistic (parametric). These co-integration tests have been recommended to remove the common time effects before performing the tests.

Table 4.2
Pedroni's (1999) Panel Cointegration Test

Test Statistics	Statistic	Weighted Statistic
Panel v-Statistic	12.54912*** (0.0000)	1.621706 (0.0524)
Panel rho-Statistic	-58.16682*** (0.0000)	-57.81221*** (0.0000)
Panel PP-Statistic	-30.90938*** (0.0000)	-32.69714*** (0.0000)
Panel ADF-Statistic	-22.68894*** (0.0000)	-22.68894*** (0.0000)
Group rho-Statistic	-62.49578*** (0.0000)	
Group PP-Statistic	-40.09874*** (0.0000)	
Group ADF-Statistic	-28.72680*** (0.0000)	

Note: Probability values are in brackets
Source: Author's Calculation

Table 4.3
Kao (1999) Panel Cointegration Test

Null Hypothesis:	No cointegration
Alternative Hypothesis:	Cointegration
ADF	**t-Statistic**
D(FLOW) D(LIQUIDITY) D(RETURN)	3.711130 *** (0.0001)

Note: *** denotes level of significance at 1% and Lag length for residuals is chosen based on SIC and Probability values are in brackets.
Source: Author's Calculation

The results of Pedroni's (1999) and Kao (1999) panel co-integration tests are reported in table 4.2 and 4.3 respectively. All the seven Pedroni (1999) and Kao (1999) tests suggest the existence of co-integration vector among the variables. Our results indicate that

the null hypothesis of no cointegration is rejected at the 1 percent e level of significance. From the above cointegration results, we found that the existence of long run equilibrium relationships among foreign capital flows, domestic market liquidity and return.

Table 4.4

Panel Long-run Estimators

Variable	FMOLS	DOLS
DLIQUIDITY	0.000248* {-3.626282} (0.0003)	-9.3125*** {-0.647075}(0.0576)
DRETURN	0.001699* {-4.789979}(0.0000)	0.001673* {-3.062672}(0.0022)

Note: * *** denotes level of significance at 1% and 10%. Probability values are in brackets () and coefficients in {} brackets.
Source: Author's Calculation

Having established with cointegration, we have examined the long run elasticities and the impact of domestic market liquidity and return on foreign capital flows. There are two long-run estimators that we have used for this purpose are FMOLS estimator and dynamic OLS (DOLS) estimator. The results are reported in table 5.4. We found, there is positive and significant effect on capital flows by market return and liquidity. FMOLS results shows positive effects for both liquidity and return on capital flows whereas DOLS shows return have positive impact but liquidity creates negative effects on flows. As prior literature suggested, FMOLS estimation corrects for endogeneity and serial correlation to the OLS estimator. It helps to correct the endogeneity bias and obtain an unbiased estimator of the long-run parameters. DOLS uses a parametric adjustment to the errors by augmenting the static regression with leads, lags, and contemporaneous values of the regressors in first differences. As the variables used in the present studies are expressed in first difference form, the coefficients on the liquidity and market return have been interpreted as elasticities. We found that a 1% increase in liquidity in domestic market increases the foreign capital flows by 0.024%, while a 1% increase in domestic return increase the capital flows by 0.169%. Future liquidity is positively and significantly associated with current flows at 1%

level in all specifications with both elasticity estimators[10]. The relation between future return and current flows is strong as per the result.

4.2.6 Impact of Flow on Liquidity and Return across Countries

To answer the question, do capital flows channelize or dry-out the market liquidity? Our results thus far suggest that capital flows tend to positively affect domestic market liquidity. From the cross-country analysis we find in overall 18 countries (developed market as well as developing markets) domestic market return fostered by the impact of foreign flows. This analysis is not only interesting from a policy perspective, but can also shed light on the relative importance of different channels through which foreign investors can affect liquidity. In the previous section due to existence of mixed level of integration among series we proceed to apply the panel ARDL approach rather than traditional panel co-integration test.

Table 4.5

Panel ARDL/PMG

Variable	**Long Run**	**Short Run**
RETURN	4.39E-06* (0.0014) [4.39E-06]	
LIQUIDITY	-1.72E-07** (0.0487) [-1.72E-07]	
ECM_{t-1}		-16.82281*** (0.0000) [-0.728168]
D(RETURN)		1.276197* (0.0020) [0.000165]
D(LIQUIDITY)		0.892979 (0.3719) [0.000208]
Hausman Test		**(0.6155)**

*Note: p-values and any subsequent tests do not account for model selection. *, **, and *** indicate significance at *1%, **5% and ***10%. Estimations are done by using PMG/ARDL in Eviews-9, *Source: Author's Calculation*

[10]See Bekaert et al. (2007)

Pooled mean group (PMG) has been calculated for all the variables to identify the short-run causality. While the first panel shows long run effects. The second panel reports both short run effects and the speed of adjustment. Hausman test is indicating that PMG is consistent and efficient estimation. The lag structure is Auto-regressive Distributed Lag (ARDL 2, 1, 1) and the order of variable is Liquidity, flows and return. We found that domestic market returns in the current month positively and significantly predict the subsequent series of capital flows for both developing and developed country in G20 countries. In line with the above statement it indicates foreign flows no doubt create liquidity by channelizing the investment through different investment but also dry-out the market with the outflows. It also implies that domestic market return attracts foreign flows positively but the domestic investors not able to appreciate their investment with the pattern of flows.

4.2.7 Cross Country Specification Results on G20 Countries

In this section, we discuss the of ARDL results based on individual country-level. The advantage of this approach is that, it can fully explore the heterogeneity in the relation between flows, liquidity and returns across countries. The best part of the panel cross country analysis is that, we can identify the long-run and short-run impacts with individual time adjustment through individual error-correction term.

The cross section short-run coefficient result shows that, flows to returns coefficients that is positive for 14 countries out of 18 countries. From the result we found, very few countries have both liquidity and domestic market return have positive effects on foreign capital flows during short-run period. These countries are Japan, Brazil, India, Mexico, Australia and Turkey. Among developed countries, Japan only response positively from flows to liquidity and domestic market return. Among developing countries India has positive impact both in liquidity and return (table 4.6). In this study, we specifically focus on the gross portfolio capital flows from U.S to India. And we found that, the foreign portfolio flows from U.S. to India helps to expand the market and allows the domestic investor to

enrich market liquidity.

Table 4.6
Cross Country Specification Results

Country	Variable	Coefficient	t-Statistic
Argentina	ECM	-0.905162	-138.2172 (0.0000)
	D(RETURN)	0.000291	1406.743 (0.0000)
	D(LIQUIDITY)	-0.000492	-127.4670 (0.0000)
Australia	ECM	-0.769527	-120.8440 (0.0000)
	D(RETURN)	4.91E-06	18167.03 (0.0000)
	D(LIQUIDITY)	2.51E-06	70285.07 (0.0000)
USA	ECM	-0.372408	-87.44073 (0.0000)
	D(RETURN)	0.001514	132.4436 (0.0000)
	D(LIQUIDITY)	0.005505	694.1205 (0.0000)
China	ECM	-0.985445	-144.4935 (0.0000)
	D(RETURN)	-2.12E-06	-1881526. (0.0000)
	D(LIQUIDITY)	-5.76E-08	-2847099. (0.0000)
Japan	ECM	-0.282283	-91.05388 (0.0000)
	D(RETURN)	4.12E-07	98847.44 (0.0000)
	D(LIQUIDITY)	7.16E-07	1228810 (0.0000).
Germany	ECM	-0.596006	-110.7149 (0.0000)
	D(RETURN)	-3.31E-06	-101292.4 (0.0000)
	D(LIQUIDITY)	-9.17E-08	-64828.49 (0.0000)
France	ECM	-0.596006	-110.7149 (0.0000)
	D(RETURN)	-3.31E-06	-101292.4 (0.0000)
	D(LIQUIDITY)	-9.17E-08	-64828.49 (0.0000)
Brazil	ECM	-0.675926	-119.3566 (0.0000)
	D(RETURN)	1.38E-05	24223.94 (0.0000)
	D(LIQUIDITY)	9.16E-06	38887.29 (0.0000)
UK	ECM	-0.753148	-143.3425 (0.0000)

	D(RETURN)	3.41E-05	2121.392 (0.0000)
	D(LIQUIDITY)	-5.04E-06	-3760.171 (0.0000)
Italy	ECM	-0.846398	-131.6138 (0.0000)
	D(RETURN)	3.31E-06	215216.9 (0.0000)
	D(LIQUIDITY)	-1.04E-06	-1303019. (0.0000)
India	ECM	-0.580154	-108.9594 (0.0000)
	D(RETURN)	3.05E-05	259692.0 (0.0000)
	D(LIQUIDITY)	3.27E-05	86130.80 (0.0000)
Canada	ECM	-0.766234	-121.3416 (0.0000)
	D(RETURN)	-5.47E-06	-67417.99 (0.0000)
	D(LIQUIDITY)	-9.59E-07	-90196.74 (0.0000)
Spain	ECM	-0.819499	-128.6004 (0.0000)
	D(RETURN)	1.53E-06	126171.4 (0.0000)
	D(LIQUIDITY)	-4.05E-07	-602924.3 (0.0000)
Mexico	ECM	-0.367542	-90.94743 (0.0000)
	D(RETURN)	0.000163	17217.22 (0.0000)
	D(LIQUIDITY)	8.00E-05	7099.134 (0.0000)
South Korea	ECM	-0.502789	-104.3497(0.0000)
	D(RETURN)	3.28E-05	109289.0(0.0000)
	D(LIQUIDITY)	-1.05E-05	-708874.7 (0.0000)
Indonesia	ECM	-0.825826	-121.5070 (0.0000)
	D(RETURN)	7.61E-05	11499.55 (0.0000)
	D(LIQUIDITY)	-2.25E-05	-6941.379 (0.0000)
Turkey	ECM	-0.744612	-119.3398 (0.0000)
	D(RETURN)	1.66E-05	501.9274 (0.0000)
	D(LIQUIDITY)	2.17E-05	6988.318 (0.0000)

Source: Author's Calculation

Section II

4.3 Spill-over Effect of Fed Policy on Indian Financial Market Efficiency and International Capital Flows

4.3.1 Introduction

In recent decades of globalized economic activity, integration of financial markets and increased in capital flows have been the most significant features of the world economy. Widespread of financial market integration and globalization have been eliminated the capital flows barriers. Now a day, the cross-border capital flows have been expanded across developing countries and developed countries than the growth of international trade. Theoretically, international borrowing and lending allows the domestic country to smoothen the economic activity. However, the role of foreign capital flows may reduce the risk by diversifying the investment strategy. The movement of capital flows leads to the increase the efficiency of domestic financial markets by exposing them to foreign market strategy, which can directly or indirectly promote economic growth. Goldstein *et.al*, (1991) have pointed out the channel of market efficiency as an asymmetric information to restrict capital flows as an instrument of growth. Some researchers have suggested that a capital inflow to an economy is the consequences of number of negative activities. Similarly, sudden capital outflows weaken the economy confront to crisis or shocks.

Despite the implication of both pros and cons foreign capital flows is important for the developing economies. To discuss about the determinant, structure and magnitude of capital flows are not the main concern rather the driving forces behind the foreign capital inflows at the point. Most of the prior empirical studies emphasized that; both the 'Push and Pull' factors approach surges of such flows. "Pull factor approach" has indicated that, the external sources that attract the foreign investor to invest in a domestic market whereas 'push factor approach' explains the domestic market strategy to affect the domestic

investment. The common interpretation of the existing literature is that low in U.S. interest rate tends to "push" capital to developing countries. Fernandez (1996) has suggested that, fundamentally emerging or developing countries capital inflows depends on the interest rate differentials on the policy rate. Recent studies by Ahmed *et al*, (2014; IMF, 2011a; IMF, 2011b) have focused on the long-term determinant of foreign capital flows changing pattern with considering the sudden stop and surge of capital flows in recent episode. Next phase study by (Ahmed and Zlate, 2014) also explored the impact of unconventional monetary policy and decreasing phase of global interest rate.

Foreign capital flows weaken its direction with the U.S. federal fund rate (Fed) raises. Proven the dominance of the U.S. economy and finance in global markets, spill-over from U.S. monetary policy to the rest of the world is not surprising. Chen *et al*, (2014) have focused on the spill-over effect of monetary policy shocks. They have found that, the spill-over effect is more in case of unconventional monetary policy than conventional monetary policies. According to them, a country's fundamental and characteristics also matter for spill-over. From the above discussion it is clear that the unconventional monetary policies effect on emerging market is much serious than the traditional policies.

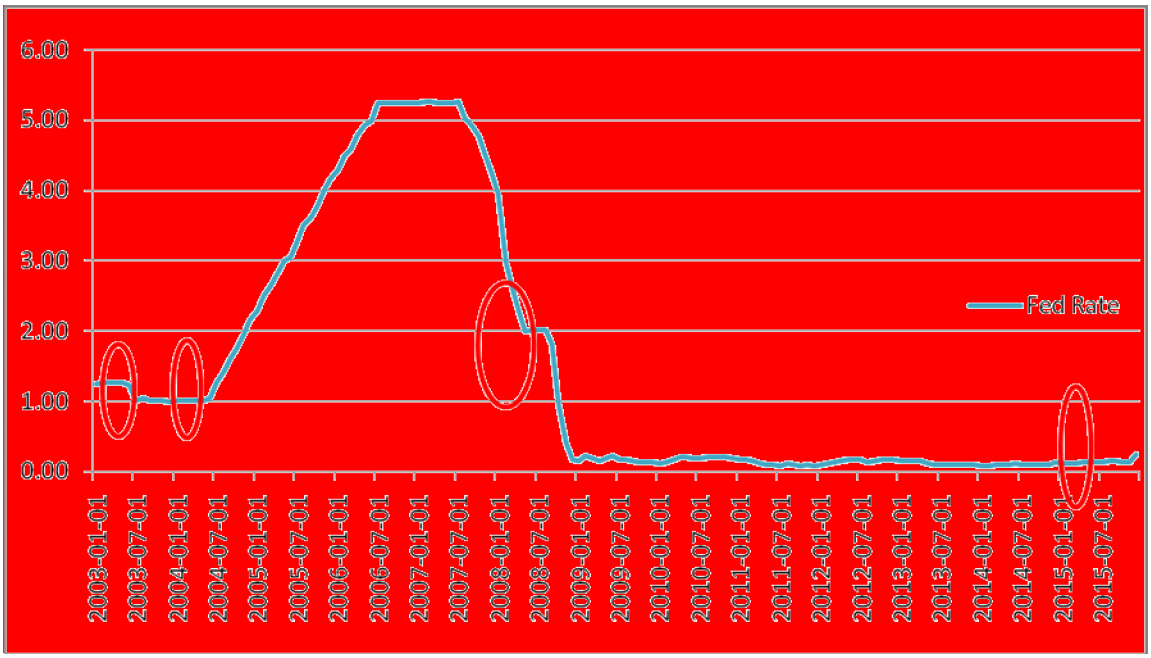

Figure 4.1: The Fed Liftoff Episode
Source: Author's Calculation

After more than six years of ultra-low U.S rates, a rate climb is a matter of alarm now. This situation is called "liftoff" episode (Ahmed, 2015). The looming Fed liftoff is triggering a lot of disquiet about the ripple effects on emerging market economies. The memory of "Taper tantrum (2013)" explained the financial shocks to emerging market evidently than the actual event. The dominant influence of U.S monetary policy on emerging markets monetary policy is a panic threat. The direction of capital flows mainly depends on the policy decision of United States. The current surge in capital inflows, especially portfolio inflows in the region, may have been induced by both push factor related to global environment and pull factors related to post-crisis changes in the domestic economic environment. Capital flows can help domestic financial market in various ways, and also adverse outflows (capital flight) leads to massive crunch.

Presently, India has been confronted with the occurrence of outbursts in capital flows and sudden reversals. To manage such dramatic situation, there are number of steps, such as

of exchange rate flexibility, capital controls, monetary policy measures, macro-prudential techniques and currency reserves. Since 2003-04, India has been faced four extensive phases of vulnerability of capital flows. During the period of 2003 to 2007, the trend of capital flows was increasing at a decreasing rate is presented in figure 4.2.

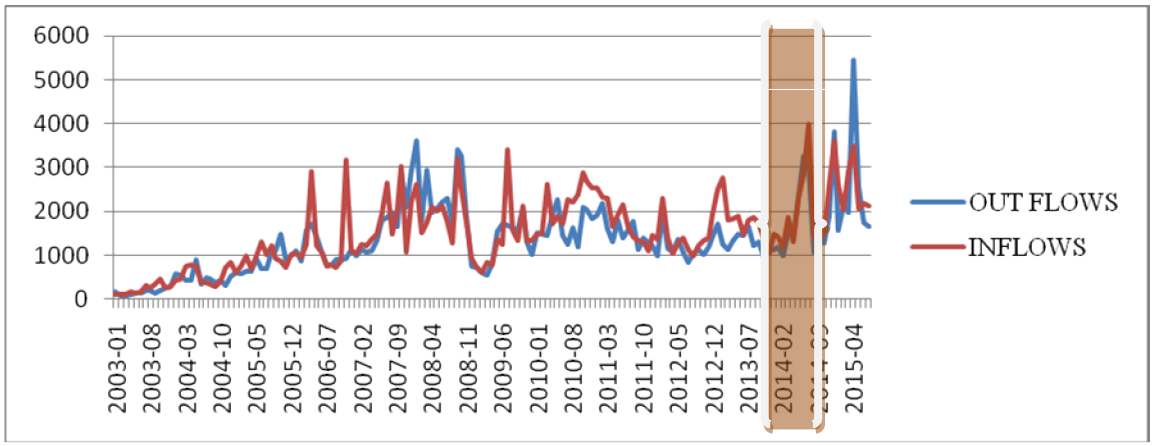

Figure 4.2: Cross Border Portfolio Capital Inflow and Outflow to India

Source: Author Calculation

This was a prominent challenge for the domestic monetary policy, the real effective rate (REER) of the rupee (trade based), which appreciated by 11.7 percent. In the aftermath of global crisis 2008, capital out flows and the pressure in exchange rate market (nominal depreciation of the rupee and REER depreciated by 11.1 percent) compelled exceptional monetary easing to prevent the condition of sluggish economy is shown in figure 4.3.

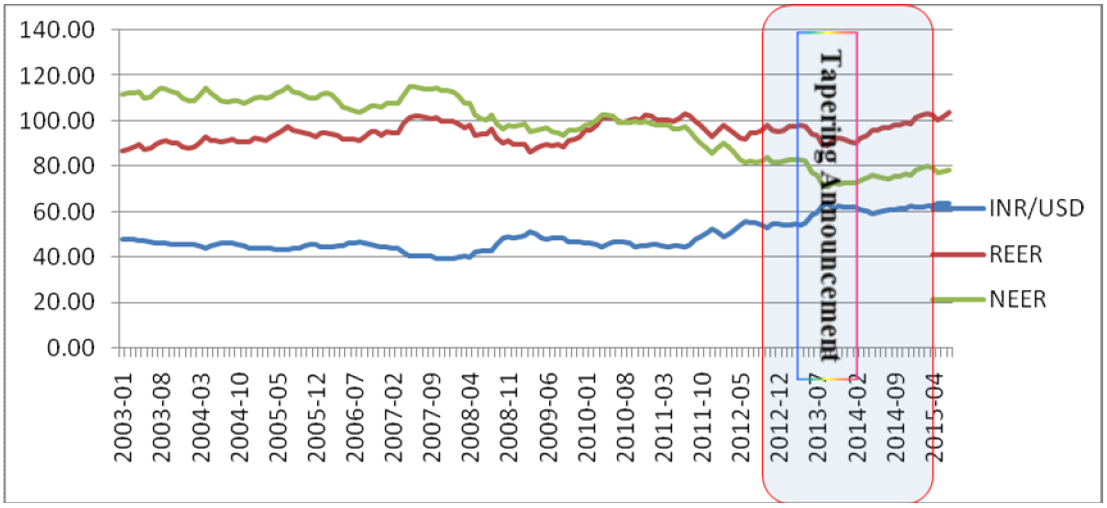

Figure 4.3: Performance of REER, NEER and exchange rate (INR/USD)

Source: *Author Calculation*

Immediately after global financial crisis, the quantitative easing (QE) has been directed to the hardening of global commodity market prices spread to emerging market economies (EMEs) including India caused current account deficit as well rising inflation. Existing literature by Farhi and Werning (2013) have suggested that, QE has also been a push factor driving waves in capital flows to Emerging Market Economies (EMEs), causing their exchange rate to appreciate and asset prices to increase beyond levels. Further, sudden and large outflows in response to taper talk since May 2013 to June 2013 have developed exchange market pressure situation. One of the highest among major EMEs currencies, the large depreciation of the rupee started after May 22, 2013 is shown in figure 4.4.

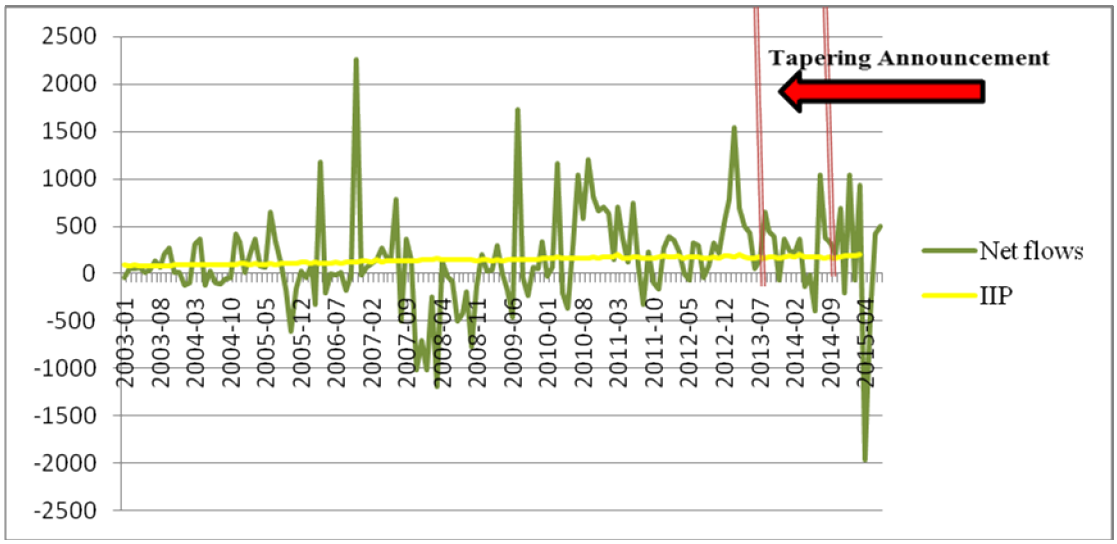

Figure 4.4: Cross-border Net Portfolio Flows and Growth Rate of India

Source: *Author Calculation*

Taper talk or QE helps Indian economy in three ways such as the urgency of curbing speculative pressures on the exchange rate, narrowing the current account deficit (CAD) and finding out external source of financing. Therefore, in this study we address three major questions to justify the study;

(1) Whether the "liftoff" rate of U.S has any spill-over effect on Indian financial market efficiency?

(2) If it is, then how it affects Indian capital market volatility: directly from the U.S liftoff episode or indirectly through the capital flows.

4.3.2 Descriptive Statistics

We have considered three variables such as BSE_efficiency, net capital flows and US_fed rate. Over the 12 years sample period, the relationship between them can be identified after the crisis period 2008. Further, volatility in the market efficiency can be estimated from the descriptive statistics is presented figure 4.4. With the standard deviation of 1.19% points and change up to 2% volatile market condition within one month time period.

Table 4.7
Descriptive Statistics

Variables	BSE_EFFICIENCY	NET_FLOWS	US_FED_RATE
Mean	02.0083%	00.0362%	146.5695%
Std. Dev.	01.1946%	00.1295%	182.8831%

Source: Author's Calculation

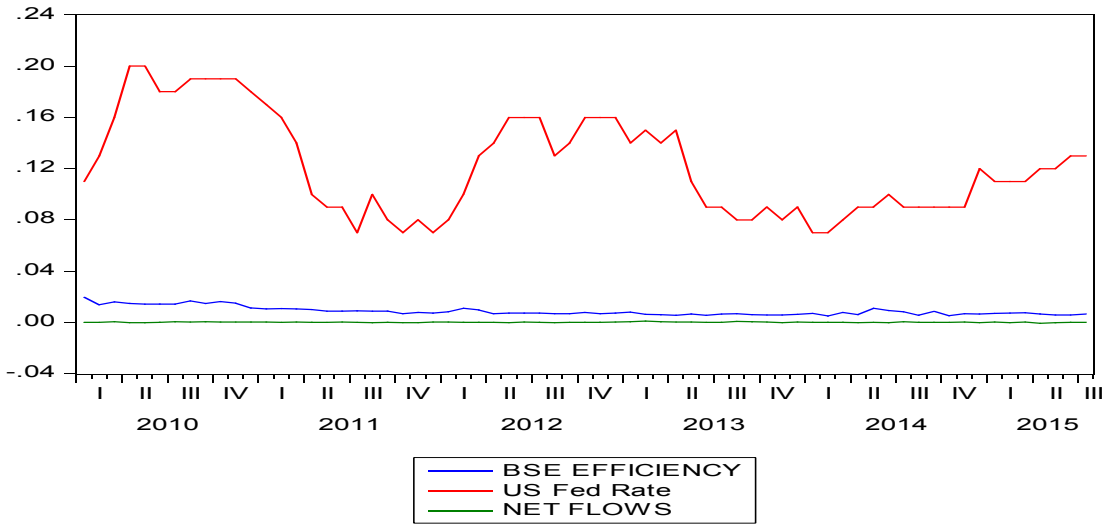

Figure 4.5: Percentage Change within Variables
Source: Author's Calculation

4.3.3 Empirical Results

The result for this chapter presented in two phases. First, we have employed VECM approach to analyze the spill-over effect of U.S monetary policy (Fed Rate) on Indian financial market approach, then we have analyzed, whether the spill-over effect directly create volatility on the domestic financial market or not by using GARCH-M model.

4.3.3.1 Unit Root Tests

Before any co-integration analysis, the variables should be stationary. All the variables are stationary at first difference value at 1% level. From table 5.8, we found that, all the variables are stationary at first difference with 13 lag order.

Table 4.8
Stationarity Test Results

Variables	*BSE_EFFICIENCY*	NET FLOWS	US_FED RATE
ADF (1ST Difference)	-13.31097*** (0.0000)	-9.979808*** (0.0000)	-5.104812*** (0.0000)
PP (1ST Difference)	-24.78329*** (0.0000)	-46.46871*** (0.0001)	-5.03594*** (0.0030)

Note: ** Probabilities for Fisher tests are computed using an asymptotic Chi square distribution. All other tests assume asymptotic normality. Lag Length are chosen by the Schwarz Info criterion (SIC).probability values are in brackets. *** denotes statistical significance at the 1% level.
Source: Author's Calculation

4.3.3.2 Cointegration Test Results

Having established that all the series are integrated of the same order I(1), thus it allows setting up the cointegration regression and testing for cointegration tests. From cointegration result, we have found both trace rank cointegration test and maximum eigen-value rank test identifies one cointegration exists among the variable at 5% level of significance. It signifies that, there is long-run association between BSE_Efficiency, Net flows and U.S._fed rate. Akaike information criterion confirms the lag length is 3 (table 4.9). Both the tests reject null hypothesis that, no cointegration vector at 95% confidence level and allow one cointegration.

Table 4.9
VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	951.2784	NA	5.01e-10	-12.90175	-12.84072	-12.87695
1	1459.378	988.5466	5.63e-13	-19.69221	-19.44809	-19.59302
2	1528.525	131.7093	2.48e-13	-20.51054	-20.08334*	-20.33697
3	1546.820	34.10132*	2.19e-13*	-20.63701*	-20.02672	-20.38904*
4	1552.517	10.38523	2.29e-13	-20.59206	-19.79868	-20.26970

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error AIC: Akaike information criterion
SC: Schwarz information criterion HQ: Hannan-Quinn information criterion
Source: Author's Calculation

Table 4.10
Johansen Cointegration Test Results

Variables	Unrestricted Cointegration Rank Test (Trace)	Variables	Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
r = 0	34.85777*** (0.0120)	**r = 0**	29.41000*** (0.0027)
r ≤_ 1	5.447761 (0.7596)	**r ≤_ 1**	4.520463 (0.8007)
r ≤_ 2	0.927298 (0.3356)	**r ≤_ 2**	0.927298 (0.3356)

Note: * denotes rejection of the hypothesis at the 0.05 level and () MacKinnon-Haug-Michelis (1999) p-values.
Source: Author's calculation

4.3.3.3 Vector Error Correction Model (VECM) Results

After finding one statistically significant co-integrating vector, we continued to estimate the restricted VAR or Vector error correction model (VECM) model with three lag order. From the table 4.11, we have found error correction coefficient term (C1) is the one period lag vector of the variables. To check the long run causality among the variable the error correction coefficient p value is essential. From the co-integrating vector, we have assumed that there is long run causality from both Net flows and U.S_fed to BSE_Efficiency. As the C(1) is -0.048060 and statistically significant with 0.0012 value is presented in table 4.12. It indicates that, there is small change in the direction of U.S monetary policy and net flows will have long-run impact on the market efficiency of Indian financial market.

Table 4.11
Co-integrating Vector Test Results

Variables	Long-run	Short-run
BSE_EFFICIENCY	-0.048060*** (0.0012)	
NET FLOWS		**.0055**
U.S_FED RATE		**0.2632**

Source: Author's Calculation

From the above table, after detection of long-run causality, we investigate the short-run causality among the variables. We have employed Wald test to estimate short-run causality among the three variables. As the variables are highly fluctuate in nature, it is desired to find the one unit shocks too from the estimated results, BSE Efficiency is the dependent variable and it is significantly affected by the net flows with 0.55% on short-run basis. Whereas, we didn't find any short-run causality between U.S_fed rates to BSE Efficiency as the estimated value signifies the acceptance of null hypothesis. Finally, the result shows that, there is long-run association between the variables but evidence suggests short-run connection between net flows to BSE efficiency. The diagnostic tests result defines goodness of model selection on the basis of R^2 and F statistics. Both are statistically significant, R^2 is more than 60%. This model justifies the serial correlation, heteroskedasticity, normality test and AR root graph is presented Figure 4.6.

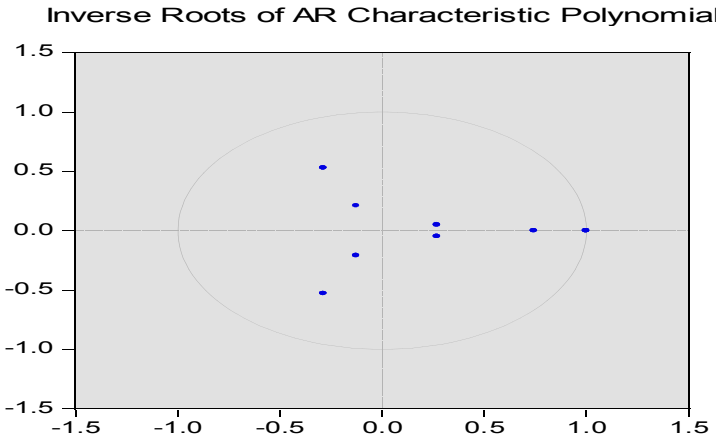

Figure 4.6: Diagnostic Check Results
Source: Author's Calculation

4.3.4 Spill-over Effects of Fed Rate on Volatility of Indian Financial Market

We have analyzed whether spill-over effect directly create volatility on the domestic financial market or not? We have employed GARCH -M model to check the volatility spill-over effect existence in the domestic market. The plotting result for residuals justify the

presence of the volatility in the series is presented in figure 4.7. As the series shows the small volatility causing another small volatility and it continues for a longer period almost after the global financial crisis to the quantitative easing phase. At this point, we have included BSE return as the dependent variable and net flows and U.S Fed rate as independent variables. We have set two equations, first part is mean and second part is variance. The test results are shown in table 5.12. Normal Gaussian distribution result confirms the ARCH effect through the resd (-1)^2. Finally, our results suggested that volatility in U.S Fed rate cannot be transmitted to domestic financial market return volatility. But in case of net flows, it transmits the volatility effect on the domestic financial market return series. This model confirms goodness of fit with the satisfying of autocorrelation, heteroskedasticity and normality test results.

Table 4.12
Results for GARCH -M Tests

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) + C(6) *US_FED_RATE				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.308798	0.075355	30.63876	0.0000
NET_FLOWS	113.2661	55.00704	2.059120	0.0395
Variance Equation				
C	0.067938	0.047007	1.445279	0.1484
RESID(-1)^2	0.506886	0.320250	1.582781	0.0135
GARCH(-1)	0.461200	0.192054	2.401407	0.0163
US_FED_RATE	0.005230	0.009562	-0.546928	0.5844

Source: Author's Calculation

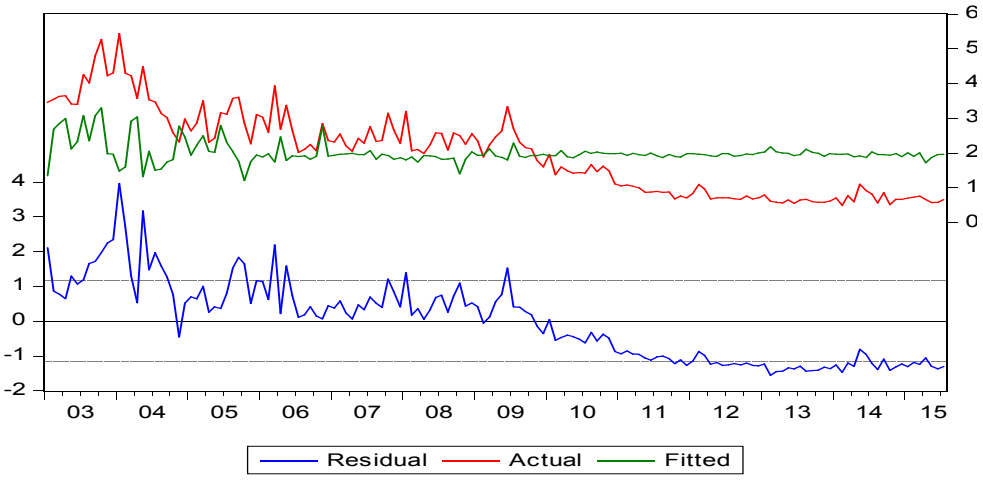

Figure 4.7 Residual Plotting Results of GARCH (1, 1)
Source: Author's Calculation

Section III

4.4 Puzzles of Indian Financial Market: Pull or Push Approach

4.4.1 Introduction

Over the years, the international capital flows have been experiencing a series of revolutions. Capital flows shriveled up in late 2001, flowed throughout the mid-2000s, decreased sharply during the global financial crisis of 2008-2009 and then the world economy has recovered quickly in 2010. During 1990s, the world economy has seen many uneven waves of capital flows. There are number of prior studies on volatility pattern of capital flows earlier. Some countries have witnessed less volatility during the global financial crisis and even aided from sudden capital inflows. During that period, the "retrenchment" process worked-out and received heavy capital flows by the liquidate behaviour of domestic investors. Ferretti and Tille (2010) have used the term 'Retrenchment' to capture the sharp increase in the foreign investment brought during the crisis period. Their econometric result shows that the magnitude of the retrenchment in

capital flows across the countries is linked to the extent of international financial integration. The global market integration increases the vulnerability of "sudden stop" episode of capital flows to domestic market. When the foreign capital flows suddenly reverse, it may adversely affect the market efficiency and create a wicked situation. Calvo (1998) found that "sudden stop" in international capital flows may bring about financial as well as balance of payment crisis. Balance of payment crisis automatically leads to current account deficit (CAD) condition to a country. It was experienced during the Mexico tequila crisis in 1994. The abruptly disappearance phenomenon of international capital flows is called as 'sudden stop' economically. The existing literature tries to identify global "push" and domestic "pull" factor in determining the capital flows to recipient economies. The equilibrium theory states that capital flows replicate the amalgamation of demand and supply, thus both push (supply-side) and pull (demand-side) aspects must exist. To consider the elements of variations in capital flows, which might be accompanying with changes in supply factors (and declining costs of funds), or changes in accompanying demand factors, rising costs of funds depends on the country's characteristics and fundamentals. Moreover, from a policy outlook point of view, huge fluctuations in capital inflows or out-flows are of particular curiosity because of their superior effect on the exchange rate and competitiveness. And also at the same time they are more probable to beat the domestic policy experience.

Major instability in capital flows can affect the economic cycles strongly, "surge" financial structure vulnerabilities, and extend overall macroeconomic instability of a country. Basically, developing countries faced this situation than developed countries for most of the time (Haber, 1997; Chang and Velasco, 1998; Calvo et al, 2004). The unusual foreign inflows had certainly been endorsed to lift domestic demand by increasing the credit growth, whereas, the sudden reversal signifies a momentous, unexpected contraction in reserves of a country. Ultimately, such reserves generate contagion effect in next economic phase. During the aftermath of global financial crisis (2008) and the recent taper talk (2013)

episode[11] this situation was felt in the Indian scenario. In this chapter, we have discussed the differentiation between the "push" and "pull" by comparing their determinants. We do so by first identifying the different puzzles of capital flows, and then we have represented these phrases along with the different macroeconomic situations of India.

4.4.2 Puzzles among the Waves of International Capital Flows in Indian Experience

The capital surge episode in India has experienced heavy inflows of foreign capital during 2005 to 2006. The influence of the global crisis on Indian stock market is felt during January 2008 of the selected sample period in our study. This originated through the reversal of inflows from foreign institutional investors (FPIs) into the country. India had received about US$ 17.7 billion as net equity investment inflows from FPIs during 2007. This has revolved into a new divestment of US$ 13.3 billion during the period from January 2008 to February 2009. This is the direct effect of the US financial meltdown of banks. The foreign investors have withdrawn funds from all over the emerging markets for meeting the liquidity requirements of their domestic market US. The marked reversal of capital inflows in India since December 2007 is presented in figure 4.8.

[11] The word tapering is used to refer to the reduction of the Federal Reserve's quantitative easing, or bond buying programme. 'Taper talk' started in June 2013 when speculation increased that Fed would start on a tapered end to QE in 2014.

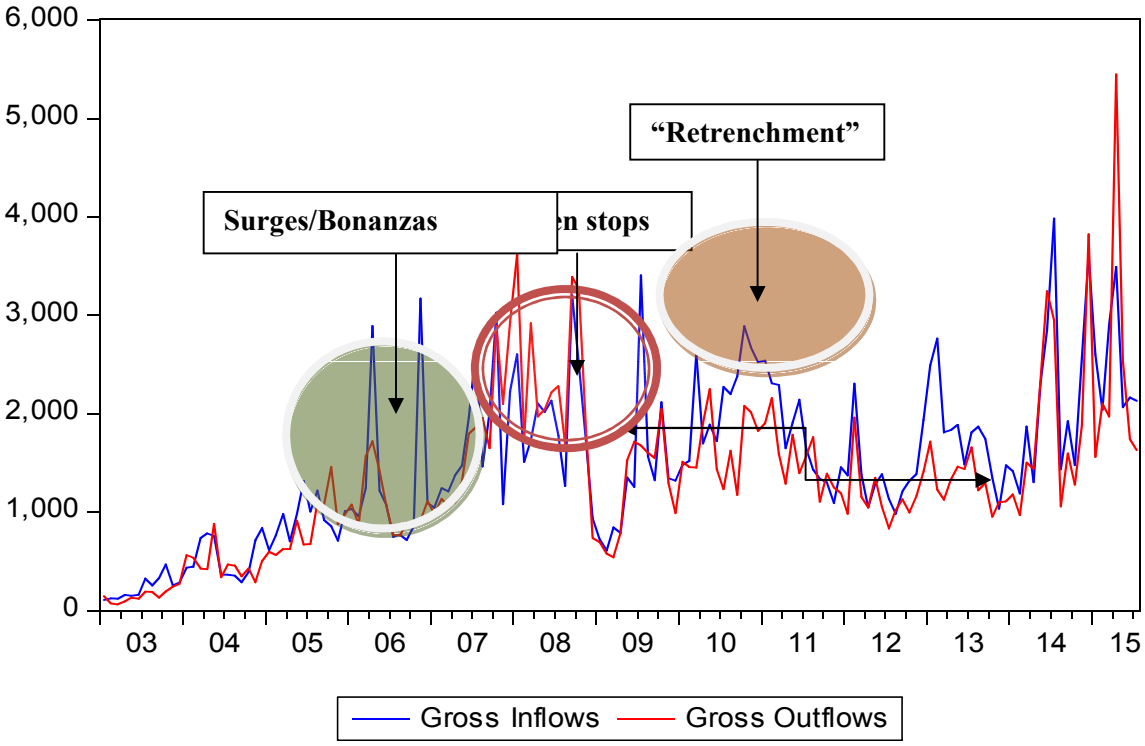

Figure 4.8: Waves of Indian Financial Market

Source: Author's Calculation

External direct equity investment from India jumped to US $ 11.3 billion in 2006-07 from US $ 3.8 billion in 2005-06. It amounted to US $ 12.5 billion during 2007-08. The huge surplus of capital flows is beyond the essentialities to meet the current account deficit in the current year. It was estimated around 1.5 per cent of GDP resulted in reserve growth of US $ 110.5 billion throughout the financial year 2007-08. During 2014-2015, foreign portfolio investments (FPIs) re-energized the equity and debt markets of India. Capital market reforms able to attract FPI inflows in the debt market of 1.6 trillion with rise in sub-limit US$ 5 billion out of overall limit of US$ 30 billion. FPI investments in equity markets were also higher than they were in 2013-14. As of august 2013, FPI flows in the debt and equity markets have been subdued at (-) 43.2 billion and 47.4 billion, respectively due to the information regarding quantitative easing (Q4).

The Indian equity market witnessed sensitive activity in 2014-15, scaling new highs on January 29, 2015. During the year, the BSE Sensex rose by 25 per cent on top of the uptick of 19 per cent in 2013-14. Equity market sentiment was supported by political stability, sustained FPI flows, lower international crude oil prices and softening of the policy rate. The equity market was also supported by global liquidity conditions and the search for yield aided by the US Federal Reserve's commitment to low interest rates, ultra-accommodative monetary policies pursued by the ECB, the Bank of Japan and the People's Bank of China. In US dollar terms, the Sensex rose by 20 per cent, turning out to be one of the best performing markets in the world. The domestic equity market also witnessed lower volatility in 2014-15 as compared to equity markets abroad.

During 2014-15, India became a preferred destination for private capital flows, which responded to improved perceptions of fundamentals, optimism engendered by a stable government at the center and expectations surrounding resurgence of business sentiment in an improved climate for investors, both foreign and domestic. The abundance of global liquidity in view of unconventional monetary policies in advanced economies also emerged as a push factor driving a relentless search for returns. Non-debt creating capital inflows alone far exceeded the financing requirement. Foreign portfolio investors brought in about US$ 41 billion to Indian equity and debt markets, making India is the most attractive destination among all emerging markets in world. Further, net foreign direct investment (FDI) inflows picked up strongly in response to initiatives that are geared towards a better business environment with policy certainty. In particular, policy measures have been undertaken with regard to easing of norms for FDI in certain sectors, allocation of natural resources, the subsidy regime, financial inclusion, employment and job creation for the youth and an improved and non-adversarial tax administration. FDI inflows to India, excluding disinvestments, were the highest after 2008-09. FDI mainly flowed into the manufacturing sector responding to the government's 'Make in India' initiative, followed by financial services, retail and wholesale trade. Within the manufacturing sector, transport equipment and chemical sectors were the major recipients and accounted for about 50 per

cent of the total FDI in 2014-15. Inflows to NRI deposits and in the form of external commercial borrowings were moderate during 2014-15 relative to the preceding year, signifying policy induced inflows in the past. With net capital inflows exceeding CAD generously, there was net accretion to reserves to the tune of US$ 61.4 billion on a balance of payment (BoP) basis.

This study makes an effort to superior understanding, what causes the real waves of capital flows. Instead of focusing the conventional type approach of flows, this chapter tries address three research questions.

(1) Which approach works in case of Indian capital flight; "Push Factor approach" or "Pull Factor Approach"?

(2) Does the capital flow associate with sizable appreciation of the real exchange rate?

(3) Do the capital flows enhance the current account position with macro-economic effect?

4.4.3 Empirical Results and Analysis

This section empirically analyses the capital outflows on some of the major macroeconomic variables in India using the monthly time series data for the period 2003:01 to 2015:07. We try to understand if due to economic fluctuation in the macro-economic variables or in external variable has any effect or not. Therefore, the following empirical analysis is carried out in the light of the recent developments in the time series analysis. Result shows that all the variables are non-stationary at level, but stationarity at first differences. Hence, they are said to be integrated of order one, and are usually denoted I (1). If all the variables in model are I (1), then it is important to discover whether a linear combination between them is stationary or not and one should move on to investigate the possibility of cointegration among these variables. We calculated the ADF and PP test statistics at the basis of 1st differenced data series. All the variables are stationary at first difference value at 1% level. From the result table 4.13, it shows the variables are stationary at first difference and 3 lag order.

Table 4.13
Stationarity Test Results

Variables	ADF (1^{st} difference)	PP (1^{st} difference)
Gross_outflows	-10.59468 (0.0000)	-33.94687 (0.0001)
Inflation	-5.204316 (0.0000)	-7.947656 (0.0000)
Policy_rate	-9.664255 (0.0000)	-11.82223 (0.0000)
REER	-10.71448 (0.0000)	-10.72500 (0.0000)
US_Fed rate	-5.104812 (0.0000)	-5.035947 (0.0000)

Note: *** Probabilities for Fisher tests are computed using an asymptotic Chi square distribution. All other tests assume asymptotic normality. Lag Length are choosen by the Schwarz Info criterion (SIC).probability values are in brackets. *** denotes statistical significance at the 1% level.*
Source: Author's Calculation

4.4.3.1Cointegration Test Results

Having established that all the series are integrated of the same order, it allows setting up the cointegration regression and testing for cointegration tests. From the estimated result, we find both Trace rank cointegration test and Maximum Eigen-value rank test identifies no cointegration exists among the variable at 5% level of significance. Both the tests accept null hypothesis: no cointegration vector at 95% confidence level. All the variables gross out-flows, real effective exchange rate, inflation and policy rate are not having any co-integration problem. So it is clear from the result that gross outflow doesn't have any long run relation with the macro-economic variables. They only maintain short-run causality among themselves, which also have the economic significance and practical justification.

Table 4.14
Johansen Cointegration Test Results

Variables	Unrestricted Cointegration Rank Test (Trace)
r = 0	60.54881*** (0.2189)
r ≤_ 1	23.38763 (0.9544)
r ≤_ 2	0.047896 (0.8486)

Note: * denotes rejection of the hypothesis at the 0.05 level and () MacKinnon-Haug-Michelis (1999) p-values.
Source: Author's Calculation

4.4.4 Capital Flight and "Push Factor" Or "Pull Factor": Indian Financial Market Experience

Explanation for the new surge of capital flows to developing country like India, have focused on two types of approaches, labelled "push" and "pull" approaches. Practically "pull" factors are those that attract capital from abroad. In our study we have taken few macro-economic variables such as; inflation, REER and policy rate as a representation of "pull" approach. On the other hand "push" factors are those that operate by reducing the attractiveness of advance market to attract investors of emerging markets. In our study we include "federal fund rate" as the proxy for "push factor". The thread-line between the two variables we have taken market integration, to represent and make an analysis of the above two approach "gross capital-outflows" particularly from U.S to India is the dependent variable.

The reports the results of our baseline VAR estimated for both the countries and variables separately. Tae table presents results based on equally weighted series and based on the U.S. dollar returns. As all series in VARs are standardized to have zero mean and unit standard variation, the coefficients can be interpreted as the effect (after one month) of a one standard deviation (ISD) shock in the right hand side variable expressed as a fraction of

one SD of the left hand side variable. According to the study by Griffin et al. (2007), the long term impact of an ISD shock to one of the endogenous variables in the baseline VAR on other variables using the generalized impulse response functions (GIRs). We focus on the cumulative response after five months, as most GIRs level off after that horizon. The advantage of using the generalized response is that the orthogonalized impulse response and variance decompositions depend on the ordering of the variables. If the shocks to the respective equations in VAR are contemporaneously correlated, the orthogonalized and generalized impulse responses may be quite different.

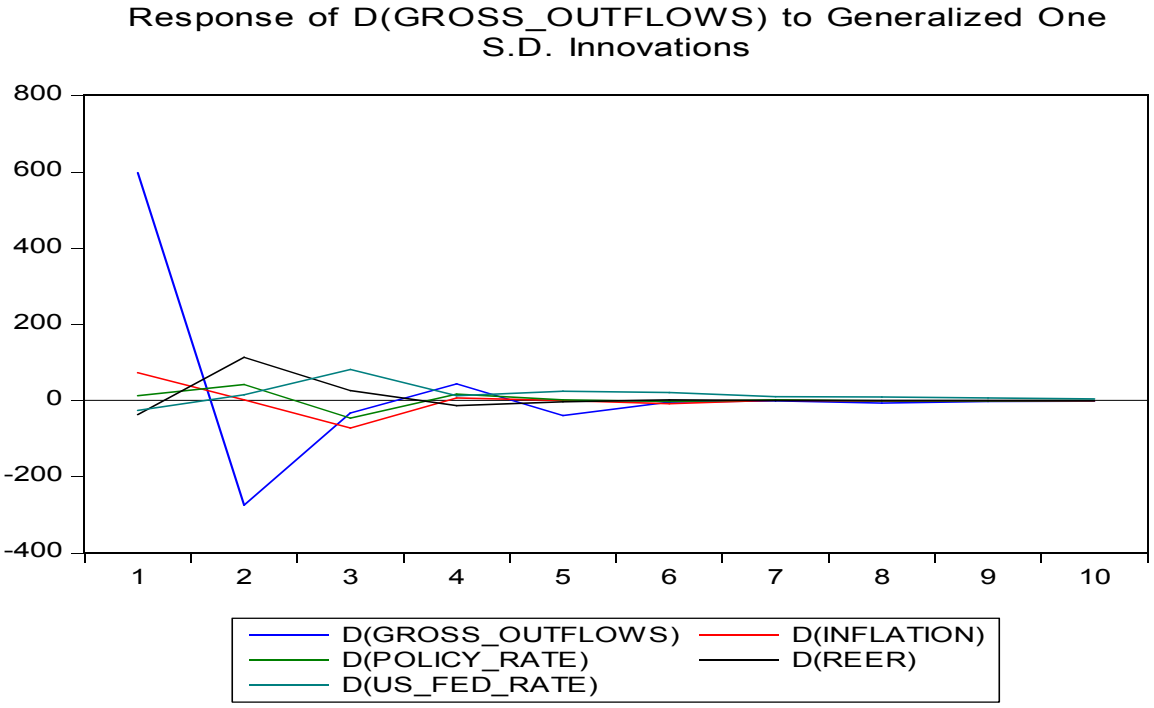

Figure 4.9: Impulse Response Function Gross Out-Flows to Push and Pull Variables

Source: Author's Calculation

Figure 4.9 presents the determination of impulse response function for gross out-flows. First, we analyse for pull factors and then push factor shocks on gross out-flows. It is obvious that with respect to structural one standard deviation (SD) innovation shocks to the inflation (dinflation) causes of gross capital out-flows first increase then it started to

decrease and continue up to fifth month. After fourth month it is fluctuating but very minutely. As we have applied the GIRF after fifth month, if there is any effect due to shocks in inflation to gross out-flows, then it would be a factor of pull approach. So the GIRF result suggests inflation does not causes capital flight or out-flows. Next, we have focused on the policy rate of domestic market as a second proxy of "Pull" approach. Structural one SD innovation shocks to the policy rate (dpolicy_rate) will trigger the gross capital out-flows (GCF) up to 4 months 22 days after it normalize to the economic situation. The real effective exchange rate (REER) structural one SD innovation shocks performance gives significant representation to GCF. With the shocks GFC increase from negative to positive till 4 months end then again started to fluctuate up to the end of five months fifteen days then standardized. Theoretically, disturbances in exchange rate and inflation will lead to an uncertain (inflationary) period ultimately causing out-flows. Among the pull factor variables shocks to policy rate do not have any serious changes in the behaviour of investor's investment strategy, whereas with the next two it is quite possible. With the major changes in inflation or trade exchange rate will attract investment from the host country. Among the inflation and REER, the preceding one shock to out-flow cause or it can change the scenario.

Now, we have focused on the "push" factor approach towards capital flight. The structural one SD innovation shocks from U.S Fed rate to GCF is first started with negative then in the second phase suddenly it increases as like to REER till four months sixteen days. Then GCF creates a dramatic phase of continuity till the eleventh month of the sample period.

Table 4.15

Results of Variance Decomposition

			Pull Factor			**Push Factor**
Period	S.E.	D(Gross outflows)	D(Inflation)	D(REER)	D(Policy_Rate)	D(US-Fed_Rate)
1	597.7001	100.0000	0.000000	0.000000	0.000000	0.000000
2	667.4714	97.11477	0.284109	2.082315	0.511108	0.007700
3	678.5244	94.20506	1.297809	2.146012	1.001360	1.349759
4	680.4074	94.10342	1.291054	2.169593	1.049186	1.396749
5	681.9948	93.99395	1.290617	2.171290	1.046063	1.512238
6	682.3633	93.89725	1.301877	2.164936	1.046746	1.599195
7	682.4392	93.87652	1.301640	2.154461	1.046863	1.620521
8	682.5316	93.86175	1.301355	2.153921	1.046587	1.636390
9	682.5672	93.85285	1.301459	2.153696	1.046491	1.645504
10	682.5833	93.84905	1.301398	2.153598	1.046448	1.649501

Source: Author's Calculation

The above table 4.15 result shows similar explanation as the GIRFs. The variance decomposition result explains the percentage of variance in GCF, inflation, REER, policy rate and U.S Fed rate. Gross out flows react its own shocks, shocks from differenced inflation and REER up to sixth month whereas, policy rate reaction to GCF was there till four months. Here shocks to own shock is 100%, it means there is no significant effect on the first month from pull and push factor to the GCF. In second month any shock to inflation and REER makes 0.28% and 2.08% variance in GCF respectively. Any shocks to Fed rate was neutral in the first month and in second month the effect was negligible but third month

onward its shock intensely seen ups and down till tenth month. Which implies significant long-run implication over GCF with different variances (1.39%, 1.51%, 1.64%) respectively. In case of pull factor, we found variables any shock to both inflation and REER have 1.30% and 2.16% variation in gross capital outflows.

From the figure 4.9, we justify the scenario of GCF during the recent U.S monetary phase of declaration. Since May 2013, taper talk (Quantitative Easing phase 4) the GCF increased tremendously. Results suggest in this period both foreign investor and domestic investor invest large amount of money outside India. So the empirical result signifies in Indian capital market both pull factor and push factor works for capital flight. But real financial situation statistically justify that "push factor approach" (declaration phase of U.S fed rate) have greater impact than "pull factor approach" (REER, Inflation).

4.4.5 Linkages between Capital Flows and Exchange Rate

Economics theory explains an inflow of International capital will raise the level of domestic spending in economy; in turn it will appreciate the real exchange rate by raising the demand for non-tradable goods. Several studies, particularly Corbo and Hernandez (1994); Calvo, Leidermann and Reinhart (1994) and Khan and Reinhart (1995), amongst others, have documented these effects for Latin America and East Asia. Some commonly observed effects of capital inflows are exchange rate appreciation, monetary expansion, rise in bank lending if the flows are intermediated through banks and effects upon savings and investment. The rise in cumulative expenditure also surges the demand for tradable, prominent to increase in imports and broadening of the trade deficit. During the capital surge in 1992-95 and 1996-97, the real exchange rate appreciated by 10.7 in Aug 1995 and 14 percent by August 1997 respectively over its March 1993 level. Glick (1998: 8) has noted that though capital inflows have been associated with real exchange rate appreciation in both regions, the extent of real exchange rate appreciation in the Asian region was far less than the Latin American countries, presumably due to differences in policy response.

The policy responses of India were directed towards capital outflows through early tuning of external debt. The timing of these inflows also facilitated India's external adjustment as they coincided with trade reforms of current account convertibility and liberalization of overseas investment by India firms (Kohli, 2001). Both real exchange rate behaviour and policy responses in India bear a closer with East Asian economies than the Latin America ones. The former most limited adjustment of their currencies via-a-vis the US dollar. In contrast to the Latin America countries particularly Argentina, Brazil and Mexico who allowed much more rate flexibility. Due to the differences of policy responses the extent of real exchange rate appreciation in Asian region was far less than Latin American countries. The capital inflows have been associated with real exchange rate appreciation in the countries. The investment/GDP ratio increased by 3.5 percent for the Asian group of countries during the capital surge (Dua&Sen, 2006). The importance of the exercise needs to be emphasized, as a significant implication of this result is that a rise in inward capital flows into the economy is likely to lead to losses in international competitiveness via real exchange rate appreciation.

The performance of the real exchange rate in reaction to capital inflows has been a significant area of an anxiety and has been detected in numerous studies. Calvo, Leiderman and Reinhart (1993) and Edwards (1999) have observed the reminder between capital inflows and real exchange rates for a set of Latin American countries. They find considerable sign towards the capital inflows contributed both to real exchange rate appreciation and reserves' accumulation in these countries. Is there any such evidence for India after 2006? We attempt a tentative exploration of this hypothesis in this section to explore the statistical significance to present situation. This study will consider the gross capital flows instead of net flows.

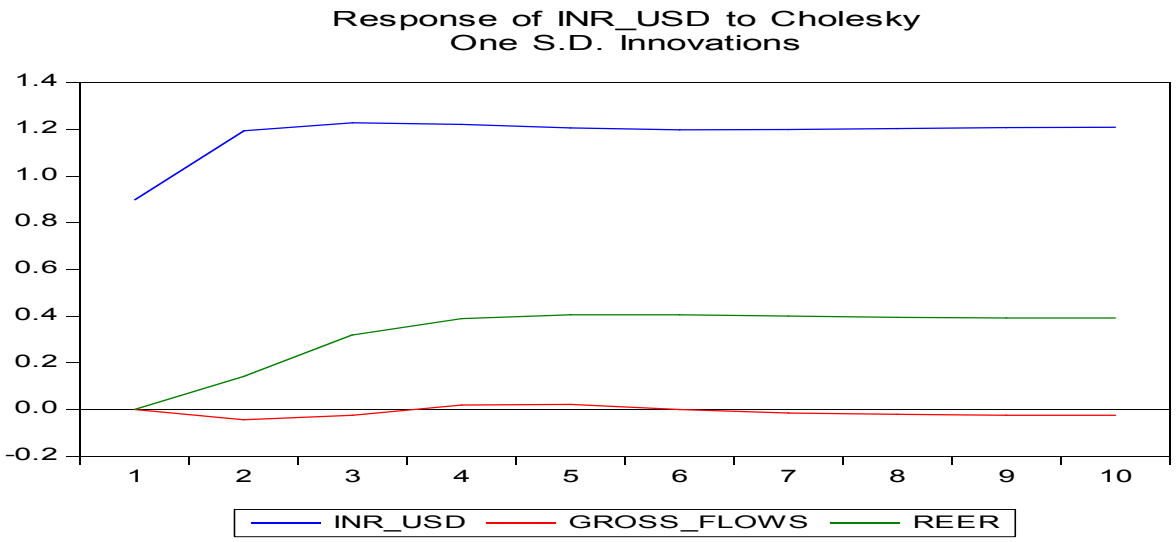

Figure 4.10: Nexus between Exchange Rate, REER and Gross Outflows

Source: Author's Calculation

Figure 4.10, determines, the coefficients in the aggregate vector error correction model (VECM) indicates that gross capital flows (GCF)one unit SD innovation shock initially create negative impression. From four months two days onwards it give positive, which continue till sixth month and it forecasts exchange rate slowly. All the series in VECM are standardized to have zero mean and unit standard deviation; the coefficient can be interpreted as the one month after effect of a one standard deviation (ISD) shock. Structural one standard deviation (SD) innovation shocks to the gross out flows will causing of exchange rate (INR_USD) initial stage give neutral symptoms and then four months onwards fluctuate negatively with outflows. It took around six months plus to maintain one stable scenario in the economy. Here also GIRF suggest outflows don't appreciate the exchange rate throughout the sample period. The nexus between REER and exchange rate is analyzed in the perspective of maintaining trade account flows. As in theory REER represents the exchange rate foe the trade balance. One unit shock to REER positively accelerates the exchange value of the country's economy.

Table 4.16
Results for Variance Decomposition

Variance Decomposition of INR_USD:				
Period	**S.E.**	**INR_USD**	**GROSS_FLOWS**	**REER**
1	0.898780	100.0000	0.000000	0.000000
2	1.501728	99.02522	0.085815	0.888969
3	1.966104	96.78003	0.065283	3.154691
4	2.346888	94.99041	0.052095	4.957491
5	2.669932	93.80997	0.046706	6.143321
6	2.954685	93.05251	0.038147	6.909339
7	3.213664	92.57556	0.034342	7.390097
8	3.454169	92.26684	0.033297	7.699866
9	3.680061	92.04684	0.033586	7.919571
10	3.893543	91.87603	0.034110	8.089865
11	4.096227	91.73709	0.034413	8.228501
12	4.289447	91.62104	0.034565	8.344396
13	4.474338	91.52268	0.034665	8.442656
14	4.651869	91.43864	0.034747	8.526615
15	4.822859	91.36627	0.034824	8.598902

Source: Author's Calculation

Table 4.16 result presents the percentage of variance from gross flows and REER to Exchange value (INR_USD). We have taken 15 horizon of time period. Initial stage of time span the exchange value react its own shocks completely so other variables are in neutral phase. An ISD shocks to current period of out flows is associated with a cumulative response of exchange value up to 0.03% SD over next fifteen month, which was 0.08% SD at the second month. Both the values are statistically significant at 5% and 10% respectively. The shocks from out flows took around ten months to be stable in a slower rate. An ISD shocks to REER connected with a cumulative response of exchange value up to 8.5%of the exchange value. As the result shown in the above table 4.4, the one unit SD shocks from gross out flows to INR_USD is significant throughout the sample period. The percentage variance is statistically significant at 1%, 5% and 10% level of significance. To answer the research question about whether gross capital flows enhance the exchange value or not, the empirical analysis suggests starting point the shocks was negative (value) then it rose to positive and the again it gave negative interaction. As theory suggests,

4.4.6. Capital Flows Enhance the Current Account Position with Macroeconomic Effect

Capital inflows can be traced to either international reserves accumulation or a current account deficit, depending upon the exchange rate regime. If there is no intervention by the central bank i.e., the exchange rate regime a pure float, then the net increase in capital asset via capital inflows can be associated with a similar increase in imports and therefore a widening current account deficit. Alternately, if the exchange rate regime is fixed and central bank intervenes to counter appreciation pressures, then the capital inflows would be visible in foreign exchange reserves. The choice of intervention, or its size, narrows down the degree of exchange rate flexibility desirable by authorities and is in essence a policy choice. In 1992, the first year of the capital surge, almost the net capital inflows were absorbed as foreign exchange reserves. In 1994, almost one third of net capital inflows were utilized from 1996 onwards, the RBI has typically absorbed 50 percent of net capital inflows into international reserves. The stock if international reserves in 1999-2000 (US $ 38 billion), represents an increase of nearly 52 percent over the 1991 level. Between the years 1991 to 2000 growth of foreign exchange reserves in India averaged 58 percent, net average 58.8 percentages against negative average of 16.8 percent for 1985-90 (Kletzer, 2004).

Table 4.17

India's Balance of Payment Position as of 2014-2015

Component	2003-04	2005-06	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
TRADE BALNCE (A-B)	-2.2	-6.2	-7.4	-9.7	-8.6	-7.5	-10.3	-10.7	-7.8	-7
(a) Merchandise Exports	10.7	12.6	13.4	15.2	13.3	15	16.8	16.7	17	15.4
(b)Merchandise Imports	13	18.8	20.8	25	22	22.4	27.1	27.4	24.8	22.5
INVISIBLES,NET	4.5	5	6.1	7.5	5.9	4.6	6.1	5.9	6.1	5.7
(a)Software Exports	2	2.7	3.2	3.8	3.5	3	3.3	3.5	3.6	3.4
(b)Private Transfers	3.5	2.9	3.4	3.6	3.8	3.1	3.5	3.5	3.5	3.2
CURRENT	2.3	-1.2	-1.3	-2.3	-2.8	-2.8	-4.3	-4.8	-1.7	-1.4

ACCOUNT BALANCE										
Net Capital Inflows	2.8	3	8.7	0.5	3.8	3.7	3.6	4.9	2.6	4.4
(a)Foregin Direct Investment	0.7	1.1	2.8	1.6	1.3	0.7	1.2	1.5	1.6	1.7
(b)Foreign Portfolio Investment	1.8	1.5	2.2	-1.1	2.4	1.8	1	1.5	0.3	2
(c) Commercial Borrowings, Net	-0.5	0.3	1.8	0.6	0.1	0.7	0.5	0.5	0.6	0.1
(d) NRI Deposits	0.6	0.3	0	0.4	0.2	0.2	0.7	0.8	2.1	0.7
(e) External Assistance,NET	-0.5	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1
OVERALL BALANCE	5.1	1.8	7.4	-1.7	1	0.8	-0.8	0.2	0.8	3

Source: Reserve Bank of India

Generally, the current account deficit (CAD) is the difference between foreign exchange inflows and foreign exchange out flow of a country. The capital account is disaggregated into flows on account of foreign direct investment (FDI), foreign portfolio investment (FPI) and loans & other flows. Moreover, the loans and other flows are the foreign debt flows into the economy. This is a standard disaggregation which recognizes the difference in variability of the FDI, FPI and loans series. The recovery of the capital flows in the post crisis phase is yet not complete (table 4.17). Also, a large part of it is constituted by loans as against equity flows. Loans have shown a continuously rising trend since 2008. The CAD declined promptly from its peak of 4.8 per cent of GDP in 2012-13 to 1.7 per cent in 2013-14 and further to 1.4 per cent in 2014-15. In the current financial year, 2015-16, it could even reduce a little further. The current account deficit is the sum of the balance of trade and invisibles such as remittances and software earnings fell to 1.2% of gross domestic product in the July-September quarter of the current fiscal, the lowest level since the fourth quarter of 2010-11. It was 4.9% in the fiscal first quarter ended June and 5% a year ago for the quarter ended September. Notably, stable capital flows like foreign portfolio equity flows and foreign direct investment to reserves is 14.5 percent as of 2014-2015 report and it is a 5 year high all total.

Section IV

4.5 Impact of International Capital Flows on Indian Financial Market and Economic Growth

4.5.1 Introduction

The essential associations among economic regulation, financial movement, and economic growth are the matters of essential point in economics and finance. The global financial crisis of 2008-2009 leads to results a favourable situation to re-examine the issue of universal financial assimilation. The financial crisis upraised the opportunity that market integration among the advanced economies went too far, strengthening the debate about the attractiveness of a laissez-faire method to the financial integration. Finance theory suggests the risk-free rate of interest can be reduced by allowing the integration of equity markets into world markets with the increase in risk sharing attitude. Stulz (1999) finds indication of the uncertain fall in the equity risk premium is associated with capital account openness. Henry (2000a), Edison and Warnock (2002) suggest that such advantage might be predictable to feed through increased private investment flows to influence growth. Few literatures observe like Calvo and Reinhart (1999) stated the integral volatility of capital flows, as evident of extreme difficult in "sudden stops". Focusing on the previous literature Stiglitz (1999) documented the characteristics of "hot money" which leads to adverse effects especially during economic downturns. Prassad, Rogoff, Wei and Kose (2003) define Countries with small "absorptive capacity" or the countries where institutions protection are weak for the investors, the flows affect more. The threat of huge and volatile capital flows is nurturing concerns in emerging markets about their hostile and destabilizing impact on market stability and economic growth.

Emerging markets' added vigorous recovery from the crisis and their stronger long-term growth prospects are the fundamental drivers of such capital flows. Asian financial

crisis of (1997-1998) is a distress related episode and relative under-development of their financial systems further heighten such concerns. Extensive studies try to get a proper idea about the relationship between financial openness and economic growth, which is the subject of hyperactive controversy. The effect of financial integration on growth is always a question mark from the economist side. According to theory access to foreign savings can promote investment and growth in developing country with the channelization of capital and investment opportunities. In real situation old understanding fails to yield considerable confirmation of a positive relationship between financial integration and growth. To the contrary, countries such as China have grown rapidly despite limited degree of financial integration. From the theoretical grounds, financial integration may demand negative growth and welfare effects. Financial integration in the presence of alterations and externalities can lead to substantial welfare prices in the worst case situations.

From the last decades, growth in emerging markets has been linked with enhancements of the current account balance. Japan, China, Korea and other countries experienced sizable increases in their saving rates shortly after their successful take-offs, and the increases were large enough to induce sizable current account surpluses. Integration of emerging markets into global financial markets is a relatively recent phenomenon. Financial integration among advanced countries took off and progressed rapidly since the end of the Bretton Woods system. Countries with extra capital market openness suffered financial instability. For example, Latin America suffered a severe foreign debt crisis which had a protracted impact on growth. However, by and large emerging markets maintained the varying degrees of restrictions on their capital accounts until the early 1990s. In a remarkable turnaround since, emerging markets joined the global trend towards financial integration, although at a more controlled pace than the headlong rush of advanced economies. FDI and portfolio equity investment are fundamentally different from each other since the FDI is accompanying with ownership and control while the latter is not. Both are different from foreign debt that creates liabilities which must be repaid. Therefore, there is no a priori reason why different types of capital flows have the same effect on growth.

Furthermore, FDI has traditionally been viewed as more beneficial for growth than portfolio capital flows.

Recent sharp changes in the investor's preference towards stock prices prompt a multitude questions about the relationship between the foreign investors investment, stock market and the rest of macro economy including economic growth. So far, the question arises: do the investors' awareness and stock market fluctuations are simply imitate of economic factors or merely a bubbles. On the other hand, do the stock price movements spill over into the rest of the economy, via institutional investment or through some other channel? In most of the countries the importance of stock market in the financial system have regularly exercised in the minds of policy-makers and have been the subject of a substantial amount of empirical research. The broad question of the relationship between financial development and economic development in general is the subject of an intense debate which has been surveyed in a wide-ranging paper by Levine (2005). Measures of financial development in this literature include more than just those relating to the stock market as well as stock market capitalization and turnover variables. Levine draws the overall conclusion that there is a positive connection between measures of financial development and economic growth and that stock market development makes a significant contribution to this effect. There are number of literatures, where the relationship between foreign institutional investors and stock market. It is very strong at the same time the macro-economic impact is very high towards the investment pattern of FPIs. In other words we can say macro-economic variable influence the behaviour of FPIs. In addition to this question, the long-run growth of the stock-market and macro-economy connection has also been analyzed from a short-run perspective, focusing on the relationship between FPIs, stock prices and macroeconomic variables such as GDP, inflation and exchange rates. Here relationships may run in both directions, from the macro-economy to the Foreign Institutional Investments and *vice versa*.

The present chapter focuses on the analysis of the relationship between stock price

and the macro-economy in India for the period since the registration of FPIs in the Indian stock market. Our focus is on the short-run interaction between stock prices and the macro-economy and behavior of FPIs, in contrast to the long-run emphasis of the finance and growth literature. Moreover, in this study we confine our attention to output as the main measure of the macro- economy. Our motivation for this research is three-fold. First, the relationship between output and stock prices is not clear; several papers like Lee (1992) for the US, Cheung and Ng (1998) for a set of five countries and Groenewold (2003) for Australia they found the impact of output shock on stock prices is negative. It suggests one distinguished explanation of demand from supply driven output shocks. Secondly, India's stock market is relatively more liquid although it is developing rapidly and an analysis of this case will balance the predominance of developed economy research. Thirdly, little is known about the output-stock-price- FPIs nexus in India. Given the growing importance of India in the world economy and in the international capital flows, the relationship between FPIs, stock prices and macroeconomic variables is an important issue in its own right and deserves a more thorough investigation. Our main objectives in this chapter is, First to examine the influence of foreign investors in explaining long run and short run dynamics with respect to stock market and its impact on economic growth. Second is to address the importance of foreign institutional investors and its response to macroeconomic variables.

4.5.2 Snapshot of Indian Stock Market and Journey of FPIs towards Economic Growth

The various reforms introduced by Indian government for encouraging FPIs to invest in Indian stock market have been effective. This enhances the investment to such an extent that in November 2010 FPIs stood at 5426 whereas it stood at 1713 in early 1990s. It results increase in liquidity, reduce risk, improve disclosure and thus FPIs have become the corner stone in the phenomenal rise of the Indian stock market.

Table 4.18
Trend of Capital Flows into India after 2003-2014 (Yearly) US $ Million

Month	Gross Purchase (Cr)	Gross Sale (Cr)	Cummulative Investment ($Mn)
2003	94412	63953.5	6627.6
2004	185672	146707	8669.8
2005	286021.4	238841	10706.3
2006	475624.9	439084	8107
2007	814877.9	743392	17655.8
2008	721607	774594	-11974
2009	624239.7	540815	17458.1
2010	766283.2	633017	29361.8
2011	611055.6	613771	-357.83
2012	669184.4	540824	24372.2
2013	794231.7	681265	20037.3
2014	531487.7	467592	10649

Source: Hand Book of Statistics on Indian Economy, Reserve Bank of India (RBI)

During the month of September 1992-1993, FPIs started their investment in Indian stock market. At that time govt. was framing the policy guidelines for FPIs flows, due to which the total investment was Rs. 13 crore. However the scenario changed within a year, the figure rose 46% of the previous amount due to open door investment of Indian government. The year 1995-1996 witnessed a massive contribution of FPIs flows of Rs. 6942 crore. But in the year 1996-1997 the investment only rose by 23.52%, due to the international market, which were in in the phase of overheating. During 1997-98, FII inflows posted a fall of 30.51%. This relaxed in investments by FPIs was primarily due to the South-East Asian Crisis and the period of volatility experienced between November 1997 and February 1998. From the entry of FPIs into Indian market the net investment flows have always been positive. Only in the year 1998-99, an outflow to the tune of Rs. 17699 crore was observed for the first time. This was primarily because of the economic sanctions imposed on India by the US, Japan and other industrialized economies. These economic sanctions were the result of the testing of series of nuclear bombs by India in May 1998. Thereafter, the FII portfolios investments quickly recovered and showed positive net

investments for all the subsequent years.

FPIs investments plummeted from Rs. 10122 crore during 1999-2000 to Rs. 9935 crore during 2000-01. FII investment continued to decline of 1.8 % in 2000-01, 11.87 % in 2001-02 and 69.29 % in 2002-03. Investments by FPIs rebounded from depressed levels from the year 2003-04. FPIs flows were recycled to India following readjustment of global portfolios of institutional investors, triggered by healthy growth in Indian economy and attractive valuations in the Indian equity market as compared with other emerging market economies in Asia. The slowdown in 2004-05 was on account of global uncertainties caused by hardening of crude oil prices and the upturn in the interest rate cycle. The inflows of FPIs during the year 2004-05 was Rs. 45881 crore. During 2006-07 the foreign institutional investors continued to invest large funds in Indian securities market. However, due to global developments like meltdown in global commodities markets and equity market during the three month period between May 2006 to July 2006, fall in Asian Equity markets, tightening of capital controls in Thailand and its spill-over effects, there was a slack in FII investments. Again in the year 2007-08, the FPIs started investing in Indian market with a great believes of Rs. 66,179 crore. On the other hand the collapses in Lehman Brother & Co. drag down the FII investment to Rs. -45,811 in 2008-09. Due to US market crash FII chose India as the best destination for investment and in result they increase their investment near about 58% more than previous 4 decades in 2010-11. Foreign portfolio investment flow turn-off the most well-known brunt of the global financial meltdown. During 2009-10, the sharp increase in FII inflows is attributable to the recovery in domestic stock markets following international trends and the comparatively better growth prospects in India.

4.5.3 Empirical Results

In the empirical results, we first check the stationarity of the five time series variables. Stationary of the variables are very much desired as non- stationary series will produces spurious regression estimates. We convert all the variables into natural logarithm for

reducing the variation and to avoid heteroscedasticity and also it will estimate elasticity in better way. As unit root tests are useful to determine the order of integration of the variable. We used both Augmented Dickey Fuller test and Phillip Peron test and found all the variables (FPIs, BSE, NSE, IIP, REER) had unit root at level but after first differencing they become stationary, that is I(1).

Table 4.19
UnitRoot Test Results

Variables	ADF(1st difference)		PP(1st difference)	
	Intercept	**Trend and Intercept**	**Intercept**	**Trend and Intercept**
FPIs	10.4816	10.4659	96.7494	116.8058
BSE	13.3053	13.3449	13.4044	13.4306
NSE	7.7246	7.7756	11.9551	11.9871
IIP	3.29492	3.2732	42.4003	42.9393
REER	13.1607	13.1813	13.0547	13.0601

Source: Author's Calculation

After all the variables became stationary, we check for the order of integration is same or not through the Johansen- Juselius co-integration test to obtain the number of co-integrating vector. From the co-integrated test the Trace statistics and the Max-Eigen test we found one co-integrated variable at 0.5% level of significance. We find 1 to 4 lag vector by using the lag length criteria. So Restricted VAR (VECM) we used. The Restricted VAR model also satisfies other criteria like, no serial correlation, no heteroskedasticity and also normality of residuals.

Table 4.20
Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.157642	74.60525	69.81889	0.0197
Trace test indicates 1 cointegratingeqn(s) at the 0.05 level *** denotes rejection of the hypothesis at the 0.05 level** ****MacKinnon-Haug-Michelis (1999) p-values**				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.157642	42.37294	33.87687	0.0038

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values.

Source: Author's Calculation

From table 4.21, we can see the error correction coefficient term (C1) is the one period lag vector of the variables. To check the long run causality the error correction coefficient and the p value is essential. From the analysis we found FPIs and NSE are significant at 5% level of significance and the coefficient is negative. This shows that the two dependent variables (FPIs and NSE) have long-run causality with other independent variables (IIP, REER and BSE). It indicates there is small change in IIP, REER, BSE will have long-run impact on foreign institutional investors behaviour and NSE. To check the short run causality we will use the Wald test.

Table 4.21
Test Result for Long-Run Causality

Variables	Error correction coefficient value	P Value
FPIs	-0.3391	0.0005
BSE	0.3710	0.0067
NSE	-0.5077	0.0003
IIP	0.0024	0.8049
REER	0.0022	0.0115

Source: Author's Calculation

Table 4.22
Result For Short-Run Causality Test

Variables		Chi-Square value
REER	FPIs	0.0049
BSE		0.5063
NSE		0.3249
IIP		0.0319
REER	BSE	0.5417
FPIs		0.1570
NSE		0.0110
IIP		0.7698
REER		0.5690
BSE		0.1499

FPIs	NSE	0.0558
IIP		0.9206
REER	IIP	0.3442
BSE		0.0594
NSE		0.0024
FPIs		0.0002
FPIs	REER	0.0294
BSE		0.0024
NSE		0.0032
IIP		0.0294

Source: Author's Calculation

From the table 4.22, it is clear that in short run FPIs granger causes REER and IIP, BSE granger causes NSE, IIP granger causes to all other variables (FPIs, REER, BSE, NSE) and REER granger causes to all the independent variables as the value is significant at 5% level of significance. Here it signifies that the IIP and REER have short run granger causes to all other variables.

4.5.4 Conclusion and Discussion

In the first section of the chapter we investigate the interaction among foreign capital flows with domestic market liquidity and market return for major eighteen G20 countries during January 2003 to July 2015. We have used pooled mean group (PMG), Autoregressive-Distributed Lag (ARDL) to find out the effect of capital flows on liquidity and market returns. We found there is significant interaction between flows and liquidity, although there are some differences across countries. In case of developed country (Japan) and in developing countries such as Australia, Brazil, India, Mexico and Turkey, capital inflows respond positively to domestic market liquidity. This suggests a positive response of inflows from U.S. market liquidity. For the host country the foreign investors shows preference for favorable liquidity conditions but they are very much inclined to seek heavy return from other markets, when the home market is flush with liquidity. Establishing causality relation between foreign flows and domestic market liquidity is difficult, as they always look for

their return without enhancing the market liquidity condition. From all the above analysis it is very clear that foreign investors tend to channelize rather than dry-out liquidity from domestic market. Hence, our analysis finds little support from the correlation that at the time of adverse environment foreign investors can destabilize the domestic market. We don't perceive the crisis period in our analysis which could explain better effect of flows on liquidity and return.

As the cross-country specification result indicates India is one of the emerging countries among the total 18 high market capitalization countries, which is having positive causality from flows to both domestic market liquidity and return with significant coefficient. The response of local liquidity to capital flows is more positive in countries with greater transparency and less developed financial market (Vagias, 2010). Our results can show a path to the investor before their investment to look into existing environment and the pattern of investment. The behavior of foreign investors can be judged with more transparent countries. It gives the scope to further study the impact of foreign capital flows and domestic market efficiency.

The second section of the chapter tries to answer the recent decade aftermath of global crisis, the global economy and its integration to domestic market puzzle a dramatic situation of craze. We have addressed two questions to analyze such situation in Indian financial market efficiency from January 2003 to july 2015. First, whether the "liftoff" rate of U.S has any spillover effect on Indian financial market efficiency? The study claims that volatility spillover exist from U.S fed rate to BSE efficiency because in case of mean estimation result, we find direct relation from capital flows to domestic market efficiency. And variance estimation result shows the autoregressive and the heteroscedasticity value is significant with positive co-efficient. Hence, the fed rate plays a vital role especially in the case of domestic market efficiency. Second, the extent of its adverse effect on Indian capital market volatility: directly from the U.S liftoff episode or indirectly through the capital flows. In this sample period, we have discussed minimum four different types of sudden surges of

capital out flows and quantitative easing episode of U.S. To address above mention two research questions we employ VECM approach and we found that domestic market efficiency is having long-run association ship between foreign capital flows from U.S to India. Directly both the variable foreign net flows and the liftoff episode (quantitative easing episode) have influence on Indian domestic financial market. With reference to the sudden out flows or to analyze the capital flight episode the short-run analysis is essential. The short-run causality results shows that, the significant relation of net flows to market efficiency, which is not in the other case of "liftoff" episode. It implies that the emotions of domestic market efficiency can be fluctuated by the US monetary policy but not directly only through the foreign net flows to India. The analysis for the volatility pattern of U.S Fed rate and foreign capital flows interaction with domestic financial market presents statistically significant result with net flows but not with Fed rate. From the policy perspective, the domestic market efficiency and global policy volatility spillover are important as they are helpful in formulating policy and also the present study calls for government intervention to check the dynamics of both equity market and capital flows to India.

Third section mainly has focused mainly on three aspects of capital flows and also through different perspective. Previous studies investigation basically based on the determinant and to cross country analysis for this purpose. We address three research questions to analyse such situation in case of Indian financial market puzzles from January 2003 to July 2015. In this sample period India hinted minimum four different phases of capital flows. The Sudden surges of capital out flows, retrenchment, sudden stops and capital flight episode. First investigation in this chapter is which approach works in case of Indian capital flight; "Push Factor approach" or "Pull Factor Approach"? We derived the result by employing the VAR analysis and found during the study period both foreign investor and domestic investor invest large amount of money outside India. Our results significantly reciprocate the present scenario of tremendously increase in capital out flows due to taper talk and QE phase 4. So the empirical result signifies in Indian capital market

both pull factor and push factor works for capital flight. But real financial situation statistically justify that "push factor approach" (declaration phase of U.S fed rate) have greater impact than "pull factor approach" (REER, Inflation). Answering to the second research question, Does the capital flow associated with sizable appreciation of the real exchange rate? In this case we have chosen two different variables to represent co-ordination among flows and exchange rate; such as rupee to dollar (INR/USD) and real effective exchange rate (REER). Result show there is long run association between them with the existence of one cointegration. We apply VECM impulse response function to reach the result. The empirical analysis suggests starting point the shocks was negative (value) then it rose to positive and the again it gave negative interaction. Both the values are statistically significant at 5% and 10% respectively. The shocks from out flows took around ten months to be stable in a slower rate. An ISD shocks to REER connected with a cumulative response of exchange value up to 8.5%of the exchange value. So in our findings we can conclude outflows don't cause to depreciation of exchange rate. To answer the third research question; Do the capital flows enhance the current account position with macro-economic effect? Theoretically by taking the data from Reserve Bank of India we conclude this is a standard disaggregation which recognizes the difference in variability of the FDI, FPI and loans series. The recovery of the capital flows in the post crisis phase is yet not complete (table 4.4). Also, a large part of it is constituted by loans as against equity flows. Loans have shown a continuously rising trend since 2008. The CAD declined promptly from its peak of 4.8 per cent of GDP in 2012-13 to 1.7 per cent in 2013-14 and further to 1.4 per cent in 2014-15. It implies that capital flows to a country don't enhance the capital account to full extent rather it helps to maintain the reserve through which the above can be maintained.

Fourth section of this chapter analysed the relationship between FPIs, stock market and macro-economy in India since the FPIs investment in Indian stock market. Monthly data we used for IIP, REER, BSE, NSE, and FPIs. We found all the variables are stationary in their first difference not in level. The Johansen- Juselius co-integration test clearly points out the existence of a positive long-run relationship from stock prices, macro-economy to

foreign institutional investment including output or growth. In our analysis of granger causality used to distinguish between short-run and long run causality. The evidence for short-run causality was modest and favoured the causality running from foreign institutional investment to growth and vice-versa. Evidence for long-run causality was much clearer, with FPIs causing growth and stock prices in the long-run and from stock prices to macro-economy. Replication of model has confirmed these findings with FPIs shocks having effect on growth and stock prices of National Stock Exchange (NSE) which was more than any effect growth might have on FPIs in short-run. While it is probable for FPIs and stock prices to respond to the information of changes in the economy, it is not surprising to find that changes in FPIs behaviour, stock prices have at best minor repercussions on the rest of the macro-economy. At a broader level, the empirical analysis results shows the capital flows-growth nexus during an era of financial integration and crisis confirm the need to differentiate between different types of capital flows. In line with the results of existing studies, our evidence indicates that some types of capital flows are more beneficial for growth than portfolio capital flows. In particular, short term debt has no effect in non-crisis period but a sizable adverse effect in crisis period. From the table 5, we can identify the variables are having short-run causality among themselves. As our objective is to find out the nexus between out-put growth and foreign investment, here the results shows a small change in NSER, BSER and FPIs activities will lead output growth of 0.24%, 0.5% and 0.02% change respectively. The analysis shows positive significance level of justification. Yes our analysis have not find any huge contribution of FPIs to output growth (IIP) but the contribution is positive in case of fulfil the gap of savings and investment.

Chapter 5

Summary and Conclusions

Capital flows across geographical boundaries have become focus of concern after the East-Asian crisis. Capital flows are the flow of funds, loans, debt and resource from the developed or industrial to developing countries. The flows of capital are both short term as well as long term in nature. The capital flows are the flows from the surplus economic units as developing countries to deficit economic unit as underdeveloped countries. In developing countries capital flows are more volatile in nature than developed countries. The total international capital flows is divided in two segments; one is Foreign Direct Investment (FDI) which include the NRI deposits as the major part and Foreign Portfolio Investment (FPI) which includes as the equity investment flows such as Foreign Institutional Investment (FII), American Depository Receipts (ADR), Global Depository Receipts (GDR), External Commercial Borrowings (ECB) and Overseas Corporate Bodies (OCB). FII is the major part of the foreign portfolio investment in India. Portfolio flows are rendering the financial markets more volatile through increased linkage between the domestic and foreign financial markets. Capital flows expose the potential vulnerability of the economy to sudden with drawls of foreign investors from the financial markets, which will affect liquidity and contribute the financial market volatility. From the various types of capital flows, Foreign Direct Investment (FDI) might be among most helpful in terms of boosting recipient countries economic growth. The composition of capital flows has also gone through a transformation over time in line with global trend.

Present study examines effect of foreign capital flows on financial market liquidity, efficiency and returns. From the last three decades of stable growth in capital flows ended with the start of World War I. The capital inflows work like the recovery during the post-war period. Bank lending saw a peak in the 1970s until the Latin American debt crisis of

1982. The 1990s boom in capital flows (both foreign direct investment (FDI) and portfolio flows) also came to a sudden end. Again during the 1990s world has seen ups and down in terms of capital inflows and out flows due to the financial crisis. The rising international capital flows were very attractive from the period 2000 to until the global financial crisis 2008. James, McLoughlin and Rankin (2014) found that, due to the crisis there is a steep decline in flows to and from advanced economies, with the fall most pronounced in terms of portfolio flows and cross-border lending by banks. In contrast, capital inflows to some economies have increased since the crisis, particularly those to the emerging Asian economies. The changing pattern not only depends on external but also internal country characteristics. Since the 2008 global financial crisis, wide-ranging cross-border capital flows into G20 nations, including inflows from both other G20 countries and non-G20 countries have stabilized, but they have only partly returned to pre-crisis high tide-lines.

The immediate impact of market opening to foreign portfolio investments (FPIs) is the surge in trading volume and capital inflows to domestic stock markets, result of which there is boom in stock prices. The stock market boom, typically, does not last for the entire period is of capital inflows. Foreign institutional investors are the main driver of the Indian equity market for the past several years. In 1997, the world economy has experienced a sharp decline in capital flows due to various reasons like South Asian crisis, turmoil in the global markets, and failures in corporate sector and accounting irregularities in US in 2002.

FPI decreases the vulnerability of financial crisis in developing countries by reducing their external debt burden from 39% of gross national income in 1995 to 26% in 2006 and increase in foreign exchange reserves to 92% of long term debt and 42% of more volatile short term debt in 2006. Global economic growth however, remained robust, with the help of current trade and business cycle during 2004-2007. The economic growth in developing country, particularly in India and China remain rapid in last few years. Now-a-days, most of the market entities are interested in attracting foreign capital, as it not only helps in creating liquidity for the firms and the stock market but also leads to lowering the cost of the capital

for the firms and allows them to compete more effectively in the global market. Up to what extent these capital flows are influential factor for the economic development of developing economies remains unanswered.

In late 1980s, India suffered an acute financial crunch. At that time, Indian foreign exchange stood at mere US $1.2 billion which could barely finance 3 weeks' worth of imports. And India had to pledge its gold reserve with IMF to secure a loan of just US $457 million. The gross fiscal deficit of the government rose from 9.0% of GDP in 1980-81 to 10.4 percent in 1985-86 and to 12.7% in 1990-91. Since these deficits had to be met by International borrowings, the internal debt of the government accumulated rapidly, rising from 35% of GDP at the end of 1980-81 to 53% of GDP at the end of1990-91. The immediate impact of market opening to foreign portfolio investments (FPIs) is the surge in trading volume and capital inflows to domestic stock markets, result of which there is boom in stock prices. The stock market boom, typically, does not last for the entire period. Foreign institutional investors are the main drivers of the Indian equity market for the past several years. In 1997, the world economy has experienced a sharp decline in capital flows due to various reasons like South-East Asian financial crisis, turmoil in the global markets, and failures in corporate sector and accounting irregularities in US in 2002. FPI decreases the vulnerability of financial crisis in developing countries by reducing their external debt burden from 39% of gross national income in 1995 to 26% in 2006 and increase in foreign exchange reserves to 92% of long term debt and 42% of more volatile short term debt in 2006. Global economic growth however, remained robust, with the help of current trade and business cycle during 2004-2007. The economic growth in developing country, particularly in India and China remain rapid in last few years. Now-a-days, most of the market entities are interested in attracting foreign capital, as it not only helps in creating liquidity for the firms and the stock market but also leads to the lowering of the cost of the capital for the firms. It further allows them to compete more effectively in the global market. Up to what extent these capital flows are the influential factor for the economic development of developing economies remains unanswered.

The analysis of the study focuses on the following objectives:

1. To examine effect of foreign capital flows on financial market liquidity and returns in selected G20 countries.
2. To examine spillover effect of fed policy on Indian financial market efficiency.
3. To identify the puzzles of the Indian financial market through pull or push approach.
4. To examine the effect of international capital flows on the Indian financial market and economic growth.
5. To suggest policy implication thereof.

The study uses the monthly time series data for different variables from the period of January 2003 to July 2015. For the first objective of the study, we use the major stock exchanges (top 20 by Market Capitalization) of issued share of domestic companies and categorize the 20 countries in our sample[12]. Our sample includes 2718 total observations from all 18 stock exchanges, such as, U.S. China, Japan, Germany, France, Brazil, U.K., Italy, Russia, India, Canada, Australia, Spain, Mexico, South Korea, Indonesia, Turkey, Saudi Arabia, Argentina, and South-Africa. We have divided our data into two sets such as, 'developed market', 'developing market and emerging market[13]'. Our final sample includes developed markets such as U.S., U.K., Australia, Canada, France, Germany, Japan, South-Korea, and Spain and developing markets such as Argentina, Brazil, China, Indonesia, India, Mexico, Russia, Turkey and South-Africa. We used various sources such as World Federation of Exchanges (WFE), yahoo finance, Money control and Quandl to collect the monthly adjusted price (P; closing price in US$ currency, which is adjusted for spilt and dividends), the monthly return index (MR), Trading volume at a monthly frequency (VO; expressed in 1000 shares) and the monthly market capitalization (MV; expressed in millions of US$). We have restricted our dataset to major stock exchanges of G20 countries[14]. In case

[12]As of 31st January 2015 monthly report of World Federation of Exchanges (WFE).
[13] As per the Dowjones, MSCI, FTSE, Russell and S&P report 2013 country classification.
[14]We refer to the exchanges on which majority of each country's stocks are listed in line with Karolyi, Lee, and Van Dijk (2009).

of U.S., we only use NYSE stock market data. For some countries like Japan (Osaka and Tokyo) and China (Shenzen and Shanghai), we have collected data from more than one stock exchange. We have taken 18 countries data out of G20 countries for our analysis. We have considered 18 countries out of 20 countries in G20 because of unavailability of data in our study. The countries, we have excluded from our analysis are Russia and Saudi Arabia.

For second objective, as high frequency information on bilateral portfolio flows amongst countries is not openly available at, we limit our analysis to U.S. transactions in foreign stocks. We obtain monthly data on cross-border equity portfolio flows to India from U.S (expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. The study period includes monthly data from January 2003 until July 2015 has been used for the study. Variables are Cross border capital flows, U.S. Fed Rate, Market Efficiency, Market Index Return and Macro-economic variables (Interest rate, Exchange rate and Inflation). We obtain monthly data from Reserve Bank of India (RBI), World Federation of Exchange (WFE) and Federal Reserve Bank of St. Louis.

For third objective, we have collected the monthly data on cross-border equity portfolio flows to India from U.S (expressed in million US$) from the U.S. Treasury International Capital (TIC) monthly reports. This study covers the monthly data from January 2003 until July 2015. Variables are Cross border capital flows, U.S. Fed rate, market index return and macroeconomic variables such as interest rate, exchange rate and inflation. We have also collected the monthly data from Reserve Bank of India (RBI), World Federation of Exchange (WFE) and Federal Reserve Bank of St. Louis.

Finally for the fourth objective, the focus is to find out the interrelationships between foreign institutional investment, output and stock prices; we employed three series, one for stock prices, one for FPIs activities and one for output. For stock prices, we used the CNX Nifty Index for the National stock exchange, BSE Sensex Index for Bombay stock exchange and for output (growth rate) we used IIP. Given that IIP is available only at a monthly

frequency, we restricted our analysis to monthly data. The sample period used is 2003(1) to 2015(7), the start of the sample being dictated by the availability of FPIs data. The stock price data were obtained from the Reserve Bank of India data base. Data in this data base are reported on a Monthly basis. As the monthly data for GDP is not available, in this paper we have taken IIP as proxy. To match the stock return and FPIs data with IIP, we use monthly data for all the variables. Neither of the series was seasonally adjusted. This was particularly obvious for the IIP data which has strong seasonal fluctuations.

The present study uses the variety of econometric tools for the analysis. For the first objective, we have tested panel unit root test by using Pedroni and Kao's cointegration test to identify the existing cointegrating vector among variables. We have also used Fully Modified Ordinary Least Square Method (FMOLS) and Dynamic Ordinary Least Square (DOLS) to find out the elasticity estimation of the variables. We have used pooled mean group (PMG), Autoregressive-Distributed Lag (ARDL) to find out the effect of capital flows on liquidity and market returns.

For second objective, a Vector Error Correction Model (VECM) has been chosen for this study as it allows identification of long and short term relationships between variables. In estimating the cointegration, first we have checked whether each of the series is integrated of the same order. Integration of a time series can be confirmed by the standard Augmented Dickey-Fuller test and Phillips-Perrons unit root tests. The number of cointegration ranks 'r' is tested with the maximum eigenvalue and trace test. The maximum eigenvalue statistics test the null hypothesis that there are 'r' cointegrating vectors against the alternative of 'r+1' cointegrating vectors. The trace statistics tests the null hypothesis of no cointegrating vector against the alternative of at least one cointegrating vector. The asymptotic critical values are given in Johansen (1991) and MacKinnon *et al.* (1999).

For third objective, Vector Autoregressive (VAR) method, impulse response function and variance decomposition technique are employed to examine the short-term

dynamics and casual relationship amongvariables. Before estimating the VAR model, we need to test the unit root tests to check the stationary properties of the variables. In this study two unit root tests, viz. Augmented Dickey Fuller (ADF) tests and Phillip Perron's (PP) test have been conducted to examine the stationarity properties of the variables.

And finally the fourth objective, again VECM framework is used to analyze the relationship between the log of stock prices and the log of output. The study finds short-run causality running from stock prices to output but not *vice versa* but claim that output affects stock prices in the long run, although they do not present test results for this hypothesis. The existing literature on the relationship between the FPIs, stock market and the economy as a whole in India is thus very limited and contradictory and considerably more through-going analysis is necessary before the relationship is well understood. In this study, we proposed to use the VECM approach, given its flexibility and the absence of any widely-accepted theoretical model of the share-market-economy interrelationship. We therefore use a restricted model.

5.1. Major Findings

The present study is organized into five chapters. First chapter introduces the study, gives an overview idea about the importance of international capital flows. The study subsequently addresses significance, research questions, and objectives, justification of the study area, methodology, data sources, time period and econometric tools of the study.

In the second chapter, we review both theoretical and empirical existing literature in relation between International capital inflows and economic growth. The study found that capital flows between the countries reduce the cost of capital, increase investment and raise output. Free capital flows promote faster long term economic growth in developing countries. Correlation between domestic and foreign financial market affects the liquidity

and market volatility by international capital flows. Third chapter includes data and methodology used for the empirical analysis.

Finally in fourth chapter, we empirically examined each objective section-wise. Followings are the major empirical findings given below:

Section I investigates the interaction among foreign capital flows with domestic market liquidity and market return for major eighteen G20 countries. We have found there is significant interaction between flows and liquidity, although there are some differences across countries. In case of developed country (Japan) and in developing countries such as Australia, Brazil, India, Mexico and Turkey, capital inflows respond positively to domestic market liquidity. This suggests a positive response of inflows from U.S. market liquidity. For the host country the foreign investors shows preference for favorable liquidity conditions but they are very much inclined to seek heavy return from other markets, when the home market is flush with liquidity. Establishing causality relation between foreign flows and domestic market liquidity is difficult, as they always look for their return without enhancing the market liquidity condition. From all the above analysis it is very clear that foreign investors tend to channelize rather than dry-out liquidity from domestic market. Hence, our analysis finds little support from the correlation that at the time of adverse environment foreign investors can destabilize the domestic market. We don't perceive the crisis period in our analysis which could explain better effect of flows on liquidity and return. As the cross-country specification result indicates India is one of the emerging countries among the total 18 high market capitalization countries, which is having positive causality from flows to both domestic market liquidity and return with significant coefficient. The response of local liquidity to capital flows is more positive in countries with greater transparency and less developed financial market (Vagias, 2010). Our results can show a path to the investor before their investment to look into existing environment and the pattern of investment. The behavior of foreign investors can be judged with more transparent countries. It gives the scope to further study the impact of foreign capital flows and domestic market efficiency.

Section II represents the spillover effect of fed policy on Indian financial market efficiency and international capital flows. We have considered different types of sudden surges of capital out flows and quantitative easing episode of U.S. We have also addressed a research question; whether the "liftoff" rate of U.S has any spillover effect on Indian financial market efficiency? We have also evaluated the extent of its adverse effect on Indian capital market volatility: directly from the U.S liftoff episode or indirectly through the capital flows. By employing VECM approach, we found that domestic market efficiency is having long-run association ship between foreign capital flows from U.S to India. Directly both the variable foreign net flows and the liftoff episode (quantitative easing episode) have influence on Indian domestic financial market. With reference to the sudden out flows or to analyze the capital flight episode the short-run analysis is essential. The short-run causality results shows that, the significant relation of net flows to market efficiency, which is not in the other case of "liftoff" episode. It implies that the emotions of domestic market efficiency can be fluctuating by the US monetary policy but not directly only through the foreign net flows to India. The analysis for the volatility pattern of U.S Fed rate and foreign capital flows interaction with domestic financial market presents statistically significant result with net flows but not with Fed rate.

Section III, identifies the puzzles of the Indian financial market through pull or push approach. In this chapter, we discuss the puzzles among the waves of international capital flows in Indian experience. In first, we have investigated whether both foreign investor and domestic investor invest large amount of money outside India. Our results significantly reciprocate the present scenario of tremendously increase in capital out flows due to taper talk and QE phase 4. So the empirical result signifies in Indian capital market both pull factor and push factor works for capital flight. But in real financial situation, it statistically justify that "push factor approach" (declaration phase of U.S fed rate) have greater impact than "pull factor approach" (REER, Inflation). Answering to the second research question, we have chosen two different variables to represent co-ordination among flows and

exchange rate; such as rupee to dollar (INR/USD) and real effective exchange rate (REER). Our result show there is long run association between them with the existence of one cointegration. We have used VECM impulse response function to reach the result. The empirical analysis suggests starting point the shocks was negative (value) then it rose to positive and the again it gave negative interaction. Both the values are statistically significant at 5% and 10% respectively. The shocks from out flows took around ten months to be stable in a slower rate. An ISD shocks to REER connected with a cumulative response of exchange value up to 8.5%of the exchange value. We can conclude that, outflows don't cause to depreciation of exchange rate. The recovery of the capital flows in the post crisis phase is yet not complete. Also, a large part of it is constituted by loans as against equity flows. Loans have shown a continuously rising trend since 2008. The CAD declined promptly from its peak of 4.8 per cent of GDP in 2012-13 to 1.7 per cent in 2013-14 and further to 1.4 per cent in 2014-15. It implies that capital flows to a country don't enhance the capital account to full extent rather it helps to maintain the reserve through which the above can be maintained.

Section IV, examine the effect of international capital flows on the Indian financial market and economic growth. We have analysed the relationship between FPIs, stock market and macro-economy in India since the FPIs investment in Indian stock market. The Johansen- Juselius co-integration test clearly pointed out the existence of a positive long-run relationship from stock prices, macro-economy to foreign institutional investment including output or growth. In our analysis of granger causality we distinguish between short-run and long run causality. The evidence for short-run causality was modest and favoured the causality running from foreign institutional investment to growth and vice-versa. Evidence for long-run causality was much clearer, with FPIs causing growth and stock prices in the long-run and from stock prices to macro-economy. Replication of model confirmed these findings with FPIs shocks having effect on growth and stock prices of National Stock Exchange (NSE) which was more than any effect growth might have on FPIs in short-run. While it is probable for FPIs and stock prices to respond to information of changes in the

economy, it is not surprising to find that changes in FPIs behaviour, stock prices have at best minor repercussions on the rest of the macro-economy. At a broader level, the results of our empirical analysis of the capital flows-growth nexus during an era of financial integration and crisis confirm the need to differentiate between different types of capital flows. In line with the results of existing studies, our evidence indicates that some types of capital flows are more beneficial for growth than portfolio capital flows. In particular, short term debt has no effect in non-crisis period but a sizable adverse effect in crisis period. Yes our analysis have not find any huge contribution of foreign capital flows to out-put growth (IIP) but the contribution is positive in case of fulfil the gap between savings and investment.

5.2. Some Policy Implications

The analysis and above mentioned results have in our judgment, important implication for policy and regulation. Portfolio capital flows are invariably short term and speculative and are often not related to economic fundamentals but rather to whims and trends prevalent in international financial markets. There are three-policy implications, which emerge from this analysis. First India should influence both the size and composition of capital flows with entertaining of domestic investor's participation. Second India should focus on strengthen the other variables like employment ratio, political stability rather than only promoting financial markets. Third, from the policy perspective, the domestic market efficiency and global policy volatility spillover are important as they are helpful in formulating policy and also the present study calls for government intervention to check the dynamics of both equity market and capital flows to India.

5.3. Limitations and Scope for Further Research

This study focuses on the effect of foreign capital flows on Indian financial market liquidity, efficiency and returns. Many studies have been carried out on this topic, but very few studies

focuses on international capital flows on financial market efficiency, liquidity and returns in selected G20 countries including India. There is not much consensus between the studies, whether for developed or developing countries. Most of the studies contain highly ambiguous and contradictory/inconsistent theoretical and empirical results. India has also not escaped from the debate or from the ambiguity of the answers. This leaves room for one more study. Further research is also necessary in order to examine the effect of international capital flows on macroeconomic variables as well as possible regime changes that characterize the nature of the transition process in the G20 countries and particularly in Indian economy.

We believe the results on the whole are interesting and may throw more light on current debates. We have attempted to use up-to-date and appropriate data and methodology. However, the study is not without its limitations. The analysis and conclusions presented in the study on dynamic short and long-term equilibrium relationship of macroeconomic variables with private capital inflows in India are subject to certain limitations. The study is constrained due to the unavailability of data from the year 2003. The models had to be reformulated in order to make them compatible with the data available. Certain variables had to be dropped on account of non-available of reliable data. Further, actual lead-lag relation along with underlying volatility of the variables could be an area of study in the process of enquiry into their integration.

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Dissemination

Journals/ Articles

- MohantyMadhusmita and Sethi Narayan, **"**Foreign Institutional Investors (FPIs) Destabilize the Indian Capital Market: An Empirical Analysis**"**. International Finance for Infrastructure Development, ISBN NO: 978-81-924302-3-2; Publisher: Bloomsbury Publications; Year of Publication: 2012.
- Mohanty Madhusmita and Sethi Narayan, "Effect of Foreign Institutional Investors (FPIs) on the Indian Capital Market: An Empirical Analysis." International Journal of Humanities and Environmental Issues (IRJHEI), Vol. I, Issue 2, May 2012, ISSN: 2277-9329.
- Mohanty Madhusmita, "Commodity Market Risk Management: Through Derivatives (Indian Prospects)", Financial Risk Management: A Challenge for the Competitive Markets, Excel Books, Vol.1, No.1, March 2011, pp. 316-326.

Communicated Paper

- Mohanty M. and Sethi N."An Empirical Analysis of Foreign Institutional Investors and the Macro Economy in India-VAR-ECM Approach" have been communicated to the Journal of Financial Market and Portfolio Management.

- Mohanty Madhusmita and Sethi Narayan "Foreign Investors and Global Capital Market Integration: Empirical Study of Emerging Indian Equity Market" has been communicated to the International Journal of Economics and Finance (IJEF), Canadian Center of Science and Education.

Workshop Attended

1. Census 2011- Primary Census Abstract (PCA), Individual SC/ST, Literacy and Workers on 21.01.2015.
2. A Four day short-term course on Fundamentals of Applied Econometrics using STATA from 28th September to 1st October 2015, organized by the Department of Humanities and Social Sciences, NIT Rourkela.
3. Intellectual Property and Innovation Management in Knowledge Era, 24th November 2015, Institute Workshop, NIT Rourkela.
4. Financial Research Workshop organized by The Financial Research and Trading Laboratory (Finance Lab) held during November 16-17, 2012 at Indian Institute of Management Calcutta (IIMC).

5. Short term course on "Work Culture, Interpersonal Skills and Career Growth" offered by the Department of Humanities and Social Sciences of National Institute of Technology Rourkela (NITR) from 20-24, 2011.
6. Multivariate Statistical Analysis (Work shop) from IIT-BHUBANESWAR on 26th March, 2011.
7. QUANTITATIVE FINANCE WORKSHOP on December 19th-22nd, 2010 at ITM Institute of Financial Markets, Mumbai, INDIA jointly conducted by Indira Gandhi Institute of Development Research (IGIDR), Industrial and Management Engineering (IME) Department, Indian Institute of Technology Kanpur, INDIA, Lally School of Management and Technology, Rensselaer Polytechnic Institute, USA and ITM, Institute of Financial markets, Mumbai, INDIA.
8. Financial Modelling and Risk Management- Theory and Practice (Work shop) from IIT-KHARAGPUR in May 2010.

Conference Paper Presented

1. "Paradox of International Capital Flows to India: A SVAR Approach" in the 1st Conference on Recent Developments in Financial Econometrics and Applications organized by Deakin University, Victoria, Australia from 4-5 December, 2014.
2. "Foreign Institutional Investments, Stock Prices and Macro-Economy in India: An Empirical Analysis" in the ICSSR sponsored International Conference titled "Shifting Paradigms in Applied Economics and Management: Course Correction" organized by Faculty of Management, Shri Mata Vaishno Devi University, Katra, Jammu & Kashmir from 1st – 2nd August, 2014.
3. Effect of Foreign Institutional Investors (FPIs) on the Indian Capital Market: An Empirical Analysis" in the International conference on Economics, Humanities, Social Sciences and Environmental Issues held on 26-27th May, 2012 at Bogmallo Beach Resort, Goa- India by Choice Institute of Management Studies and Research.
4. "Foreign Institutional Investors (FPIs) Destabilize the Indian Capital Market: An Empirical Analysis"in the International Conference on Frontiers of Infrastructure Finance (ICFIF 2011) by IIT-Kharagpur from Dec. 28-30, 2011.
5. "Displacement caused by Industrialization: A case study of Orissa" in the International Conference organized by National Institute of Technology, Rourkela from 13th to 14th November, 2010.
6. Presented a paper on "Application of Econometrics in Finance", 14st April, *2010* NIT, Rourkela.
7. Commodity Market Risk Management: Through Derivatives (Indian Prospects) in the National conference on Financial Risk Management- A challenge for the competitive Market organized by Rourkela Institute of Management Studies (RIMs) on April 29-30, 2010

Resume

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Number of Publications: 3

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Presented Paper in Conferences: 10

Short Term Course /Workshop Attended: 8

Research Methodology Course: 2

Doctoral Fellowship: Qualified Doctoral fellowship Indian Council of Social Science Research (ICSSR), 2011.

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